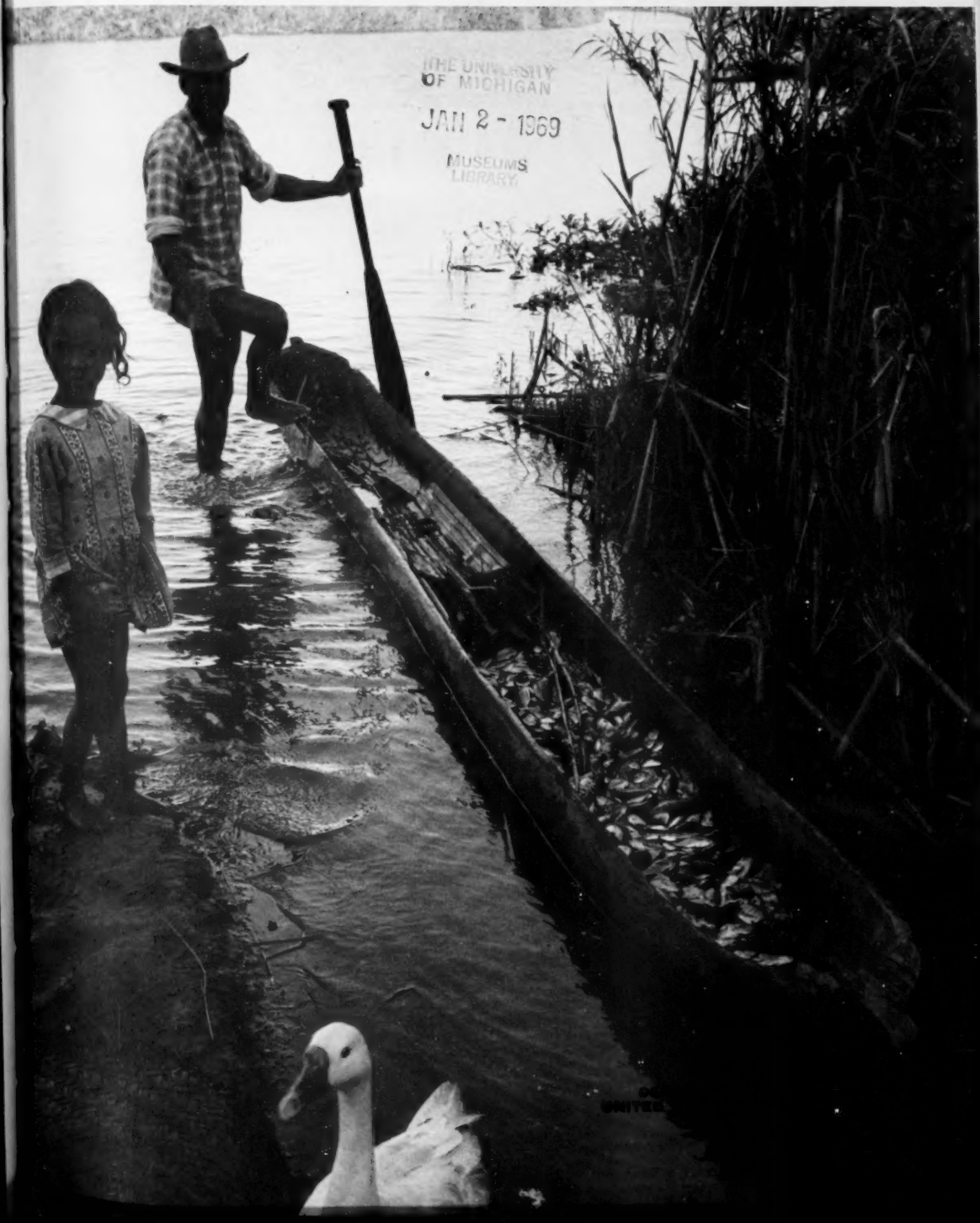
Museum

COMMERCIAL FISHERIES Review

VOL. 30, NO. 11 NOVEMBER 1968



COVER: A fisherman on the large island of Malagasy, off Africa's southeast coast, returns to his village with a pirogue full of small fish. (FAO/P. Pittet)

COMMERCIAL FISHERIES

Review

A comprehensive view of United States and foreign fishing industries--including catch, processing, marketing, research, and legislation--prepared by the Bureau of Commercial Fisheries.

FISHERMEN'S MEMORIAL--GLOUCESTER, MASS.

Managing Editor: Edward Edelsberg

Production Manager
and Associate Editor: Jean Zalevsky

Associate Editor: Barbara Lundy

Production: Alma Greene (Senior Compositor)
and Mary Andrews

The Bureau of Commercial Fisheries and
The Bureau of Sport Fisheries and Wildlife
make up The Fish and Wildlife Service of
The United States Department of the Interior.

Throughout this book, the initials BCF stand
for the Bureau of Commercial Fisheries.

Address correspondence and requests to: Commercial Fisheries Review, 1801 North Moore Street, Room 200, Arlington, Va. 22209. Telephone: Area Code 703 - 557-4246.

Use of funds for printing this publication was approved by the Director, Bureau of the Budget, April 18, 1968.

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402.
Price 60 cents (single copy). Subscription Price: $7.00 a year; $2 additional for foreign mailing.

CONTENTS

A day nursery school in Rangoon, Burma, where an experimental meal including fish flour was served each day. In foreground, Mary Ross of U. S., an FAO nutritionist. (FAO/S. Bunnag)

U. S. AWARDS CONTRACT FOR FISH PROTEIN CONCENTRATE PLANT

The U. S. Department of the Interior awarded a contract on October 21 for a large-scale, pilot-demonstration plant in Washington State to produce fish protein concentrate (FPC).

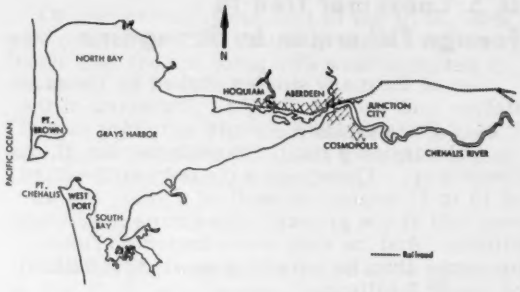
The plant will use the solvent-extraction process developed by BCF scientists. The BCF product, made from whole Atlantic red hake, a codlike fish, looks like a light-tan flour and is nearly odorless and tasteless. It is more than 80 percent animal protein and has nutritional minerals. About 6 pounds of fish are needed to produce 1 pound of FPC.

Experts concerned with the world's population explosion and the desperate need to find new food sources believe FPC can become a lifeline to a better tomorrow for hungry millions throughout the world. Today, about 2 billion of the more than 3 billion people on earth, including 50-70 percent of preschool children, suffer from protein malnutrition.

Contract Winner

Ocean Harvesters, Inc., of Los Angeles, Calif., was selected to build and operate the plant at Port of Grays Harbor, Aberdeen, Wash. The plant will not produce FPC on a commercial basis. It will show the practicability of the BCF solvent-extraction process and accumulate information on the technical and economic aspects of production to aid private industry in building plants for commercial production.

The plant will begin to operate during the 1970 fishing season. Hake and hakelike species are plentiful near Grays Harbor. Other species also can be used.



Port of Grays Harbor. (U. of Wash. Press)

BCF Process

BCF scientists at the College Park, Md., laboratory and at a model-scale plant in Beltsville, Md., near Washington, D. C., worked 3 years to develop the present process for making FPC. One breakthrough was achieved with the discovery that isopropyl alcohol would satisfactorily extract oil and water from the fish. It was an indispensable step toward making a stable and palatable product from an inexpensive fish.

The scientists found that FPC blends well with other foods. It was tested successfully as an ingredient in soups, beverages, noodles, bread, gravy, and cookies. The addition of FPC increased their nutritive value appreciably.

FPC Approved by Scientific Groups

The National Academy of Sciences advised Interior Secretary Udall that "fish protein concentrate, from whole hake, as prepared by the Bureau's process, is safe, nutritious, wholesome, and fit for human consumption." The Food and Drug Administration approved it.

△△△△△△△

UNITED STATES

U. S. Consumer Tied to Foreign Fisherman by Strong Line

One of the many stories etched by the statistics and text in BCF's "Fisheries of the United States--1967" would surprise one of the publication's main characters--the U. S. Consumer. Though he eats only an average of 10 to 11 pounds of seafood a year, his annual bill at the grocery store runs over $2.6 billion. And he eats more imported fishery products than he would guess: $1.2 billion of the $2.6 billion.

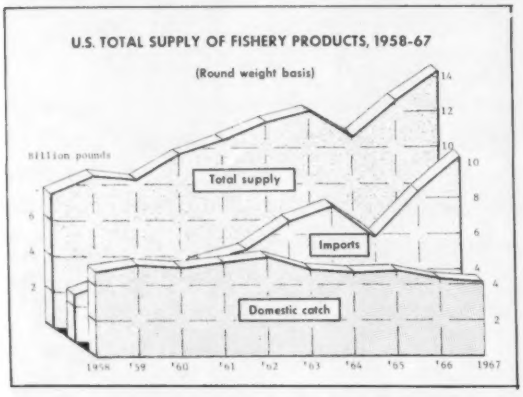
In 1967, the supply of all fishery products in the U. S., on a live-weight basis, was 14.2 billion pounds; 71% of this was imported. (For 1968, the estimates are 17.5 billion pounds--75% imported.) Of the 14.2 billion pounds in 1967, a little more than 9 billion pounds (live weight) were used for industrial purposes--for animal feed, fish feed pellets, Irish moss extracts, etc. About 82% of the 9 billion was imported.

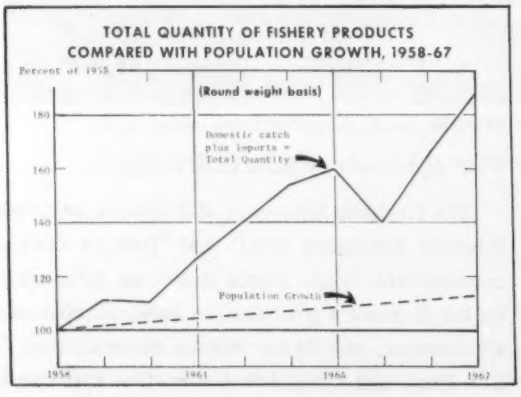
Fish meal and scraps are the most important industrial products. These are protein feeds for animals. About 75% of the fish meal used in the U. S. is imported. So agriculture too--in the production of meat and other animal products--depends to a significant degree on foreign fishing industries.

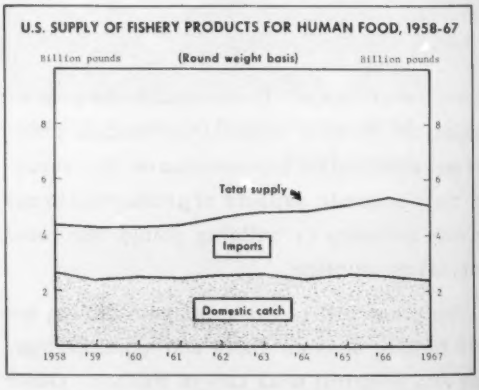
EDIBLE SEAFOOD

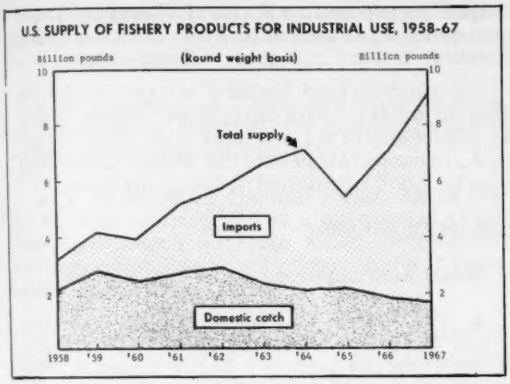
In 1967, the total U. S. supply of edible seafoods was 5.1 billion pounds, live weight. About 53% of this was imported. (In 1968, the figures are 5.5 and 40%.) The imports included frozen fillets, steaks and blocks; frozen tuna for canning; canned tuna, sardines, lobster, crab, and oysters; frozen lobster meat, lobster tails, and packaged frozen scallops.

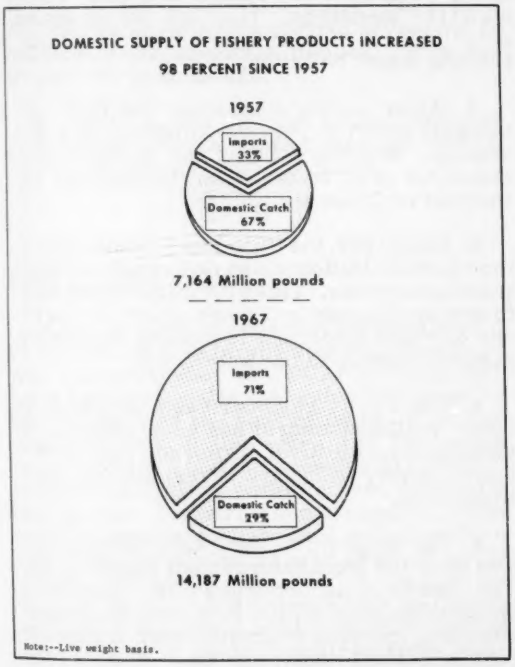
However, most imported fishery products are fresh or frozen in bulk or wholesale packages. Then U. S. processors further process these items and market them under labels the U. S. consumer knows. Most important of these products are frozen fish sticks, fish portions (used in fish sandwiches) fish steaks, fillets, scallops, shrimp, and canned tuna.











Fish sticks have become popular in U. S. households. They are made mostly from frozen blocks of groundfish fillets. In 1967, 80% of the U. S. supply of groundfish and ocean perch fillets was imported. The U. S. turned out 158.4 million pounds of frozen fish portions, 73.9 million pounds of frozen fish sticks, and 82 million pounds of fresh and frozen fillets and fish steaks. This was a total of 314.3 million pounds. In 1967, 189.5 million pounds of frozen slabs and blocks and 94.1 million pounds of fillets were imported--a total of 283.6 million pounds.

Tuna and Shrimp

Of the canned tuna sold in the U. S., 45% was processed domestically from imported fresh and frozen tuna; 14% was imported in the can.

Over half the shrimp eaten in the U. S. was imported: 202.7 million pounds of the 394.7 million pounds consumed.

Leading Exporters

The largest exporters of edible seafood to the U. S. are Canada, Japan, and Mexico. Canada supplies most frozen fillet blocks to make fish sticks, portions, steaks, and fillets. Mexico is the number one supplier of frozen shrimp. Japan is the source of most imported tuna. Often, it is less expensive for U. S. processors to import these items than to buy them at home; sometimes, availability of domestic products is the deciding factor.

10 U. S. Firms Participate in Munich Food Fair

Ten U. S. fish-processing firms displayed their products at the International Food Fair in Munich, West Germany, Sept. 21-29. BCF's Office of International Trade Promotion, which fosters and coordinates U. S. participation in such fairs, reported excellent prospects for sales in several European nations.

Some Firsts

Several items were shown in Europe for the first time and attracted both trade visitors and public. These included Maine sardines in a flip-top aluminum container; eels, considered a prime delicacy; and 2 forms of fish chowder.

Other products displayed and provided were: canned river herring and roe, canned Gulf and Alaska shrimp, frozen Maine shrimp, individually-quick-frozen (IQF) jumbo shrimp, IQF oysters, and breaded scallops.

Albacore Fishery Is Productive Off Northwest

For the third year in a row, the albacore fishery off the west coast was centered in the Northwest. Fishing there set a record. There was little commercial activity off California.

Up to September 21, Oregon landings were 17,200 tons. This was 45% more than a year earlier--and more than the total 1967 Northwest catch of 16,000 tons. If the weather continued good, it was predicted that 1968 Northwest landings could reach 20,000 tons.

California Catch Poor

California's albacore catch was even lower than last season's catch and the poorest since 1941. Up to September 21, landings were about 3,000 tons. Last season's catch was only 6,800 tons.

Despite California's poor catch, total Pacific coast production may reach or top 23,000 tons. This would put 1968 well above the average--despite major geographic dislocations in where albacore were found.

Prices Up

Exvessel prices were above last year's: in California, $425 per ton; in the Northwest, $425 for cannery fish and $400 for fish in the freezer.

50,000 Miles of U. S. Streams and Rivers Are Cleaner

U. S. grants to cities and towns to combat water pollution have helped to clean up more than 50,000 miles of streams and rivers in the last 8 years, Secretary of the Interior Stewart L. Udall has reported. He said Federal aid to construct waste-treatment plants now totals over $1 billion and has enabled communities to build $4.4 billion worth of waste-treatment facilities.

Udall said: "The Federal construction grant program has meant cleaner water in more than 50,000 miles of America's streams and rivers. This achievement is a classic example of a productive Federal, State, and local community partnership. We are all pulling together toward one goal: Clean water."

He summarized Federal water pollution control enforcement activities. Since 1960, 33 enforcement actions have been held by the U. S., in cooperation with the States, involving nearly 1,000 cities and 1,100 industries.

Report Highlights

Udall also reported these highlights:

- The Water Quality Act of 1965 and the Clean Water Restoration Act of 1966 are stimulating the national water cleanup program. The 1965 Act established State water quality standards. The 1966 Act expanded greatly U. S. financial commitment to controlling water pollution.

- Water quality standards--the first nationwide effort to prevent pollution--are operating. Secretary Udall has approved the standards of 41 States, 2 territories, and the District of Columbia.

- Since 1962, the U. S. has awarded more than 3,000 pollution-control research contracts and grants. This $100 million program to develop cheaper and more effective methods of waste treatment is moving laboratory results directly to the waterfront.

- The first regional-basin approach to water pollution control has been adopted. It includes Snake River, Colorado River, Potomac River, Delaware River, and the Lake Erie basin.

- The program to fight Lake Erie pollution resulted from enforcement conferences. The Lake Erie Report urges immediate start on spending $1.1 billion to control municipal pollution, and $285 million to curb industrial contamination. (See page 5.)

- Enforcement actions on Lake Michigan and the Boston Harbor area resulted in agreements to stop pollution. The 4 States bordering Lake Michigan, and the cities and industries involved, agreed on a strict schedule to build pollution-control devices. The Boston Harbor agreement will help to restore the million-dollar shellfish industry to New England.

• Fishermen are back at the North Platte River, which once was nearly suffocated by its own pollution.

• In Colorado and New Mexico, strong enforcement of Federal law removed radioactivity from the Animas River.

• This summer, people swam again for the first time in years at a once-polluted Cleveland beach on Lake Erie. A $325,000 Federal grant plus local money made it possible.

• Federal agencies are cooperating to eliminate pollution caused by Federal activities. Interior Department's Federal Water Pollution Control Administration "has helped develop water pollution control programs at military bases, hospitals, national parks and forests and post offices."

• The U. S. and the States have expanded programs to produce trained personel needed in the pollution-control campaign.

Plan to Save Lake Erie

A comprehensive report by the Department of the Interior's Federal Water Pollution Control Administration (FWPCA) on badly polluted Lake Erie calls for action that must be taken to prevent the possibility of "a biological cataclysm" in this lake. The plan urges an immediate start on spending $1.1 billion to control municipal pollution, and $285 million to curb industrial contamination. This would be enough money to curb pollution from cities and industries through 1990. It would begin to reverse the degradation trend in the lake. However, more money would be necessary later to control wastes washed into the lake from farm lands, overflows from combined sewers and, after 1990, to compensate for population increase.

Owe It to Posterity

Secretary of the Interior Stewart L. Udall said that "while Lake Erie is seriously polluted, this report has found that it can be rescued. We owe it to posterity to make an all-out effort to save this most seriously polluted of the Great Lakes while there is still time.

"Rising pollution of the Great Lakes, the largest treasury of fresh water on earth, is the natural resource tragedy of our time and could, unless checked, eventually destroy these magnificant inland seas. This looming potential disaster has only recently attracted national attention because pollution is a patient assassin which chokes its victims ever so slowly and silently."

Udall said vigorous action already is being taken by Interior Department, the States, and local governments to stop the rising tide of pollution in these lakes. But these efforts will never succeed without public support.

FWPCA Head Hopeful

FWPCA Commissioner Joe G. Moore Jr., in his introduction to the report, acknowledges that "man is destroying Lake Erie." He points out, however, that of the Great Lakes, Erie is "the most amenable to corrective measures because of its relatively small volume, rapid flushout time and the high volume of input of excellent quality Lake Huron water."

He adds: "The cleanup of Lake Erie is less a problem of engineering than it is a problem of diverse, inadequate, and unwieldy. . .governmental policies, funding, and management. The technical engineering methods of waste control are known or close at hand. . . ."

The Problem Areas

The report identifies 298 municipal and 182 industrial polluters around the lake, the amount and types of their pollutants, control measures required, and schedules of measures needed, or being followed, to diminish pollution.

The most serious problem is the accelerated aging of the lake. This is caused by nutrients, phosphorus and nitrogen, in sewage, and some industrial wastes that act as a fertilizer to stimulate algal growths. The organic remains of this superabundant aquatic crop place a severe demand on the oxygen in the water. The demand is estimated to be 18 times greater than the oxygen depletion caused by treated sewage.

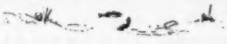
The report states that nearly one-fourth the lake becomes nearly devoid of oxygen in

its bottom waters during the summer. This situation is becoming worse. Man's activities have prematurely added an estimated 15,000 years to the natural age of the lake. But "the rate of aging. . .can be brought back to near the natural rate."

Even if the present trend is reversed, the report warns, the algae problem will persist for several years. This is because the nutrients already stored in bottom sediments are recycled in summer. "Therefore, it is possible that in a relatively short time the overproductivity of Lake Erie can become self-sustaining because of this ever-increasing reserve. It is also possible that if this alarming process grows, Lake Erie may face a sudden biological cataclysm that will exhaust, for all time, most of the oxygen in the greater part of the lake."

To reverse this trend, FWPCA recommends drastic reductions in discharges of phosphorus into the lake.

Only the joint management of water resources by Canada and the U. S. can achieve a cleanup of the lake, the report concludes.



States in Lake Michigan Basin Act on Pesticides

The conservation and resource agencies of Illinois, Indiana, Michigan, and Wisconsin signed an agreement during the summer to protect the Lake Michigan basin from any more pesticide pollution. Under the agreement, reports the Great Lakes Commission, the States will "inventory, monitor and tighten enforcement" over all possible sources of contamination in the lake area.

Farm & Urban Run-off

Surface run-off waters from about a third of the 4-State land area drain into Lake Michigan. The waters carry along some chemicals used to control insects on farms and in towns.

The Commission says the lake's pesticide contamination was dramatized by "recent findings that DDT was the most probable cause of the death of some 700,000 coho salmon fry hatched from eggs taken from Lake Michigan brood stock."

Minnesota Acts

In an action related to the 4-State compact, the Minnesota Conservation Department halted, in August, the use of "hard" pesticides on all lands it controls. "Hard" pesticides are those that do not break down into harmless compounds after application.

Advisers Appointed to Aid Columbia R. Temperature Study

Interior Secretary Stewart L. Udall has appointed a Technical Advisory Committee for Biological Effects to help in the study of whether hot water discharges could harm salmon and other aquatic life in the Columbia River.

The 16-member committee will assist Interior's Federal Water Pollution Control Administration (FWPCA), BCF, and the Atomic Energy Commission in the 2-year study that started February 1968.

The advisory committee members represent States, the Federal Government, and power companies.

Interior Department's Marine Resources Programs Unified

Dr. J. L. McHugh

The Department of the Interior's marine resources programs have been brought together under an Assistant Secretary for Fish and Wildlife Parks, and Marine Resources, Clarence F. Pautzke.

He will be supported by a new Office of Marine Resources (OMR). Acting chief of OMR is Dr. J. L. McHugh, on detail from his permanent post as Deputy Director of BCF.

Office's Duties

OMR will coordinate and advance Interior's "marine resources policies, programs, plans, and legislation. It will work with other Federal agencies, state and local governments, international organizations private industries, universities, the scientific community and the public."

OMR will coordinate Interior's contributions to the marine resources data systems. It will help develop policy guidelines for "marine pollution control, estuarine studies, international research, survey and development activities, multi-use of the coastal zone and high seas."

Inflation Hits King Crab

Probably few food products have gone up as much in price as have king crab this year, reports BCF Seattle. The September wholesale price of fancy canned king crab (24/7½ oz. cans) at $31.00 to $31.50 per case was about 57.5% above a year earlier. In contrast, the average Bureau of Labor Statistics index for all selected fishery products for July 1968 was 22.7% less than a year ealier.

The following wholesale price quotations reflect the sharp price increase in king crab over last year.

	1968	1967	% Increase
King Crab - canned, fancy: 24/7½ oz. cased	$31.00-$31.50	$19.50-$20.50	57.5
King Crabmeat - frozen:			
5 lb. blks/lb.	2.60- 2.65	1.49- 1.53	62.5
2½ lb. blks/lb.	2.65- 2.70	1.51- 1.55	74.2
1 lb. blks/lb.	2.80- 2.85	1.53- 1.61	77.0
Dungeness Crab - canned: 24/6½ oz. case	17.00	15.50	9.7

The scarcity of king crab this year has stimulated competitive buying from fishermen to a point where September exvessel prices of 30 cents to 35 cents a pound were almost triple the 11 cents per pound price of 1967.

Loran 'All-Weather' Navigation Begins in Gulf of Mexico

On November 1, a $2 million Coast Guard radio-electronic system went on the air making possible precise, all-weather navigation throughout the Gulf of Mexico. Three Loran (for Long Range Aid to Navigation) stations went into operation.

Rear Admiral Ross P. Bullard, Eighth Coast Guard District commander, said "the system amounts to a revolution in navigation for the Gulf of Mexico. Mariners who use it will be able to pinpoint their locations without visual reference. Whether they are out of sight of land, or if it's overcast, if the compass is broken, regardless of winds and currents . . . Loran will give them a fast and accurate position fix."

The Loran system took 17 months to construct. It places an electronic grid over the entire Gulf. By obtaining readings on 2 of the Loran "grid" lines, the user can determine his position merely by finding where the 2 lines cross on a Loran chart.

Before Loran

The Coast Guard said that before its system went into operation navigation in the Gulf was limited to one or more of these methods:

Celestial fixes: obtainable only in clear weather, accuracy limited by an individual's skill.

Dead reckoning methods: "calculated guessing at best." It is accurate only when careful attention is given to correct observation--and to such factors as currents, winds, time underway, compass readings, and depth soundings. Accuracy is limited by individual's skill.

Radar: usable for point-to-point navigation only when there is an identifiable land mass in range.

Radiobeacons: limited in range and having wide margin for error.

Depth soundings: navigating along fathom curves by depth soundings is common practice in Gulf. It is rudimentary dead reckoning that provides only remotest index of position and wastes time and fuel.

The Loran System

Loran has been used since World War II, but the new chain in the western Gulf is the first built primarily for commerce rather than defense. There are two Loran types: "A" and "C." Loran "A" is the type operated by the Coast Guard in the Gulf. It guarantees accuracy within one mile at its maxiumum useful range of about 800 miles.

Loran "C" is even more precise and complex. Its range and accuracy are far greater than needed in the Gulf. Its equipment also is much more costly--more than such users as commercial fishermen can afford. A good Loran receiver for type "A" is about $2,000.

The new system incorporates two existing stations at Cape San Blas and Venice, Fla. With a third station at Biloxi, Miss., they had formed a Loran chain that provided good coverage only in the eastern Gulf. By the time their signals reached the western Gulf, they were no longer usable for position fixes.

The station at Biloxi was closed Nov. 1 when the new Grand Isle facility began transmitting. This was done to integrate the old chain and the new one to give better coverage throughout the Gulf.

How Loran Works

Loran navigation is based on measurement of time that elapses at a receiver between arrival of signals transmitted simultaneously from 2 different points. The receiver acts like an electronic stopwatch. The Coast Guard explains: "It begins counting when it receives the first signal and stops when it receives the second. The elapsed time gives one reading. A smooth curved line can be drawn through any number of points where the time elapsed between reception of the two signals is constantly the same." This line is a "line of position" or "a Loran line."

The Loran transmitting stations operate in pairs. Each pair produces the 2 signals needed to get one line of position reading. Pairs are further arranged in chains of 3 or more stations. When the chain arrangement is used, the intermediate stations operate in both adjacent pairs. In the Gulf Loran chain, there are 4 pairs of stations:

--Port Isabel and Galveston
--Galveston, the master station, and Grand Isle.
--Grand Isle and Cape San Blas
--Cape San Blas and Venice

For each pair, a straight line (the base line) can be drawn through the 2 stations. At this base line, all the Loran Lines are perpendicular, and from there they extend out over the Gulf in long sweeping curves through various arcs. For example, because the base line between Galveston and Port Isabel is at considerable angle to the base line between Grand Isle and Galveston, the Loran lines of position from the 2 pairs cross hatch the Gulf in a distorted grid pattern. The same is true of the other pairs.

How Navigator Uses It

To find out where he is, the Loran navigator gets readings from 2 pairs of stations. These readings correspond to Loran lines of position overprinted on regular nautical charts. He locates the lines on his chart and traces them to the point of intersection. That point is his location. It is then easy for him to translate this information into latitude and longitude, or relative bearings.

Commercial Fishermen Aided

The Coast Guard believes commercial fishermen in the Gulf can benefit much from Loran. Its precision navigation can mean greatly reduced running time to and from fishing grounds--saving fuel. When good fishing areas are located, they can be pinpointed for later trips or to guide other boats to the area.

Accurate position reports through Loran also will bring help faster. The Coast Guard has had to search thousands of square miles of ocean when looking for a fishing boat in distress that gave only the vaguest indication of its position. In some cases, the time consumed in such a search could mean the difference between life and death--or between loss of a valuable boat and catch and a safe return to port.

Loran charts for the Gulf and air navigation charts are available. Coast and Geodetic Survey chart No. 117 also is available. Others, as they are published, will be obtainable through authorized sales agents.

Data Center Gathers Definitive Story of the Sea

During 1967 the ocean data-gathering agencies of the U. S. Government reported the findings of over 600 cruises of their research and exploratory vessels to the National Oceanographic Data Center (NODC) in Washington, D. C. It was the first time that complete information on the total national marine-science effort became available in one place. NODC also filled a role in global oceanography: It was one of two nerve centers providing information to oceanographers everywhere. The second center is in Moscow.

NODC is sponsored by U. S. Government agencies interested in the marine environment. It is governed by an Advisory Board representing these agencies and the National Academy of Sciences. The U. S. Naval Oceanographic Office manages the Center. NODC's mission "is to acquire, process, preserve, and disseminate unclassified oceanographic data for scientific, industrial, and defense purposes."

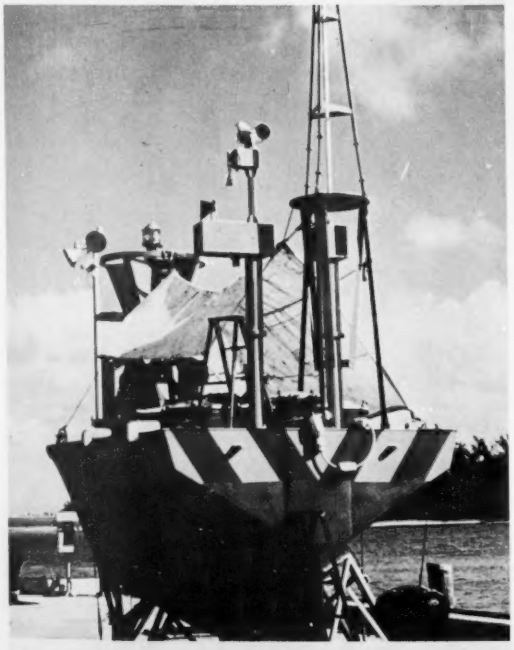


Fig. 1 - Nomad (Navy Oceanographic Meteorological Automatic Device) buoy transmits data up to 2,000 miles over standard 100 words-per-minute radioteletype circuits. (U. S. Navy)

Reorganizes to Meet Challenge

Early in 1968, NODC reorganized its operation to cope with the great changes taking place in data gathering. Nansen bottle casts are being replaced by continuously recording salinity-temperature-depth (STD) systems that can be kept in place. The mechanical bathythermograph (BT) is giving way to the more exact XBT. More buoys are being anchored throughout the oceans. These are equipped to sense and record great amounts of data. The types and amounts of oceanographic data received from manned and unmanned satellites are increasing rapidly.

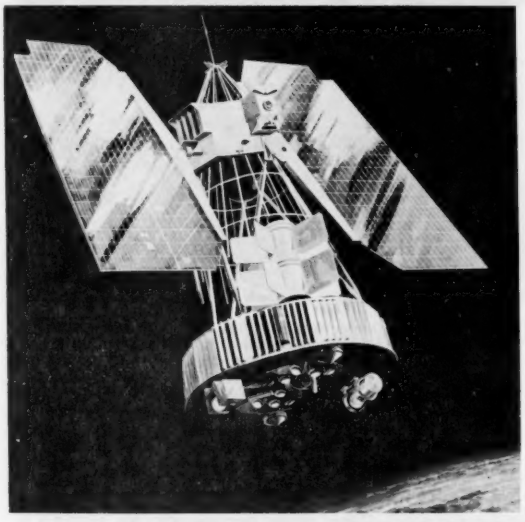


Fig. 2 - Nimbus weather satellite (NASA).

National Marine Data Inventory

NODC conducted the first National Marine Data Inventory (NAMDI) during fiscal year (FY) 1968 in order to become a central bank of information on the national effort in oceanography. It recorded the more than 600 cruises conducted by U. S. agencies. NAMDI includes information on quantity and type of data, area of operations, and persons participating. Track charts and narratives are available for many cruises. Statements on sampling and analytical techniques are included. The results are being automated.

When this task is completed, NODC will be able to answer--by use of punched card or magnetic tape sorts--such questions as: "Has

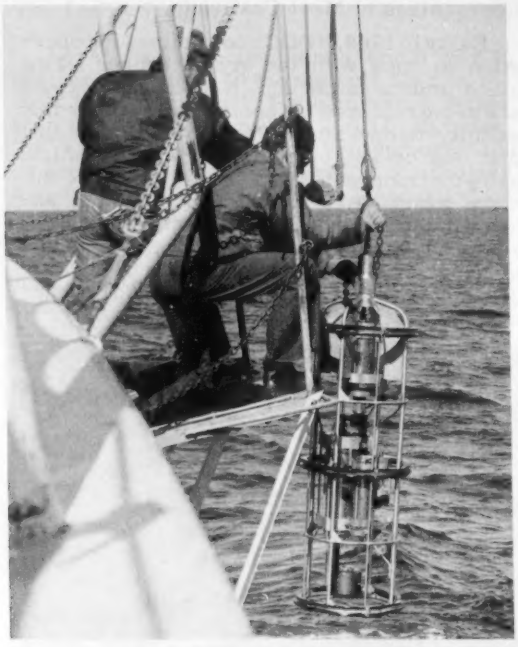


Fig. 3 - Ocean Science Important to Ice Patrol Vigilance--The constant study of the ocean currents, which greatly influence iceberg movements, is important to the Ice Patrol's predictions and tracking plots for iceberg seasons. Here, a Salinity Temperature Depth Sensor system is used on the Coast Guard oceanographic vessel "Evergreen" on a mission to determine if the source of the Labrador Current is in the Hudson Strait. The Sensor systems instantaneously record readings of salinity, temperature, and depths down to 1,500 meters. (U. S. Coast Guard)

anyone sampled euphasids in Providence Channel? Who took cores in the Indian Ocean? Where? Who has them now? Were South Pacific plankton species studied during the austral winter? What was the total number of United States research vessels operating in the Atlantic during the last fiscal year?"

World Data System

As one of the two centers of the world data system, NODC makes available to world's scientists information from a list of cruises included in a U. S. Declared National Program (DNP). Information from 366 cruises was identified as DNP.

Vast Influx of Information

A great stream of information flows into NODC. Oceanographic station data (Nansen casts) and bathythermograms continue to exceed the influx of other data types. During FY 1968, over 31,000 oceanographic stations and 110,000 BT observations were received. Biological data came at a rate of about 500 stations per month. In geology, a good start was made on sediment data from the U. S. Naval Oceanographic Office and Scripps Institution of Oceanography. Seismic reflection

Fig. 4 - Nansen bottle is attached to wire to obtain temperature, pressure, and water sample at predetermined depth.

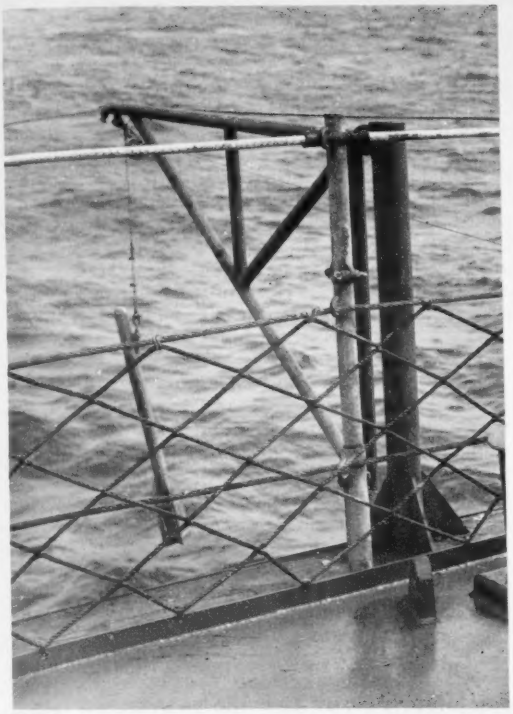


Fig. 5- Bathythermograph makes quick record of temperatures at different depths. Data are useful in finding fish.

Fig. 6 - Biologist using a light transparency meter to measure turbidity in the waters of Galveston Bay, Texas.

data holdings increased by 32,000 miles of records--primarily for the Mediterranean, Atlantic, and Pacific.

NODC Achievement

NODC data processing of Nansen casts has compiled the most comprehensive file ever set up in oceanography. After 2½ years of work, the Nansen cast data file of geosorted stations has been made worldwide. It consists of 54 reels of magnetic tape, each more than a half-mile long, packed in 556 characters per inch. The file has over 280,000 stations in every ocean of the world; it has over 6 million tape records. The oceanographer can find comprehensive information about "temperature, salinity, oxygen, phosphorus, nitrogen, and silicate data observed at specific depths."

NODC hopes to get a new computer that will increase its processing capacity at least 8 times. It will enable the Center to furnish information about "biology, geology, salinity, temperature, depth, sediment chemistry, and a host of user-oriented systems."

NODC Director

The NODC operation is headed by Dr. Thomas S. Austin, former director of BCF's Tropical Atlantic Biological Laboratory in Miami, Fla. Dr. Austin became NODC director on July 2, 1967. He serves too as Director of World Data Center A, Oceanography.

OCEANOGRAPHY

Scientists Record Whale 'Talk'

Scientists from the U. S. Naval Oceanographic Office (NOO) and the University of Rhode Island successfully recorded the sounds of 7 different species of whales and dolphins inhabiting the North Atlantic on a recent cruise off Nova Scotia, Newfoundland, and New England. The tapes now are being studied to compare the mammal 'talk' with similar sounds heard by Navy sonarmen tracking submarines.

In addition, the scientists under Dr. H. E. Winn, professor of oceanography, University of Rhode Island, bounced sonar signals off the aquatic mammals to determine the strength of the resulting echoes. These echoes, reported Lt. J. Lawrence Dunn, a NOO biologist, have been known to create problems for the Navy's antisubmarine forces.

Sight 7 Species

Sailing on August 13 aboard the "Trident," an 180-foot research vessel operated by the university, "the scientific party and crew recorded sightings of several hundred whales and dolphins of seven species" from August 20 to 22, reported Lt. Dunn. The scientists successfully launched active and passive sonobuoys--sophisticated acoustical devices used to pick up mammal 'talk' and the echoes bounced off their bodies. The expendable active sonobuoys were used as sound sources for bouncing signals off the mammals. These buoys also enabled the scientists to receive acoustic data while sailing a normal course. The passive buoys were used to transmit the mammal 'talk' to the ship.

Early Success

Lt. Dunn recalled: "We encountered a pod (school) of killer whales" after the ship had barely cleared the harbor at St. Johns, Newfoundland. "The proximity of the nearby land mass made our active sonobuoy work impossible, and problems with the videotape system prevented the university personnel from carrying out planned observations on this species."

On the next day, however, the scientists spotted large numbers of pilot whales and recorded their sounds before the Trident was forced by icebergs and the illness of a university graduate student to return to St. Johns.

On August 15, after abandoning their plan to circumnavigate Newfoundland, the scientists headed southwest to Cabot Strait. On August 16, they sighted finback whales about 60 feet long. They deployed the active sonobuoys and recorded mammal echoes despite the failure of one of the three buoys.

Rough weather hindered the hunt until August 20, when the Trident came within inches of a 55-foot sperm whale. After the scientists recorded the sound produced by this whale, and another encountered later in the day, they again saw finbacks. But the sperm whales talked so loud that they obscured the sounds of the finbacks.

"I obtained my revenge on one of the offending sperm whales by tagging him with a Fisheries Research Board of Canada whale tag," Lt. Dunn said.

After shaking off the sperm whales, the scientists recorded the sounds of 3 other species--pilot whales and bottlenose and dolphins--during August 21 and 22.

Data from 'Oceanographer' & 'Discover' Cruises Microfilmed

The Environmental Data Service, a component of the Environmental Science Services Administration (ESSA), has microfilmed most of the observed geophysical data gathered during the USC&GSS Oceanographer's 1967 Global Cruise and the USC&GSS Discoverer's 1968 African Cruise.

Copies of these preliminary data and reduced geophysical data from the USC&GSS "Pioneer's" 1964 International Indian Ocean Expedition and the Pioneer's 1965 and "Surveyor's" 1966 West Coast Upper Mantle Project are now available from the Environmental Data Service, Silver Spring, Maryland 20910.

Two C&GS Survey Ships Commissioned

Hydrographic survey sister ships of the Coast and Geodetic Survey, "Fairweather" and "Rainier," were commissioned October 2 in Seattle, Wash.

The 1,627-ton, 231-ft. vessels, equipped with the latest electronic, depth recording, and positioning equipment, will chart U. S. coastal waters to help provide safe navigation for commercial shipping and recreational boating. They will operate in Alaskan and West Coast waters.

Vast Undersea Valley Shown Off Oregon

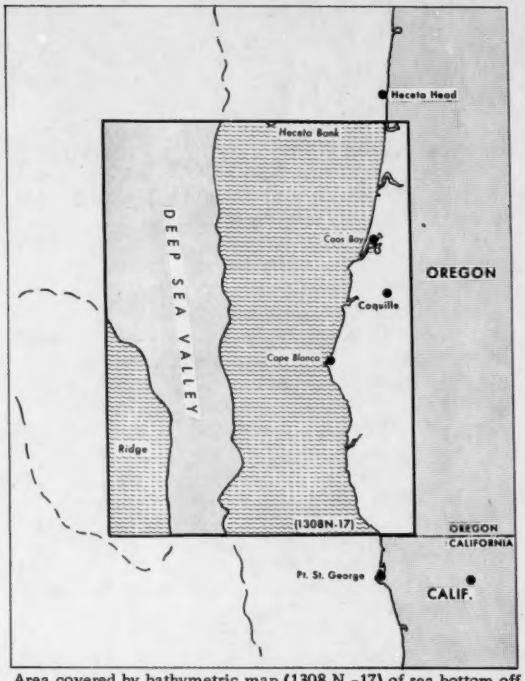
A new map of the ocean floor published by the Coast and Geodetic Survey shows a vast undersea valley off the Pacific Coast. The valley extends about 400 miles along Oregon and California. Approximately 35 to 60 miles from the coast, about one to two miles below the sea surface, the valley is 15 to 60 miles wide.

About 140 miles of the valley appear on the new bathymetric map. The map covers approximately 13,000 square statute miles of sea bottom. It extends 65 to 95 miles seaward off the south Oregon coast, from Cape Ferrelo to the Umpaqua River. Depths range from a few feet off the coast to over 10,500 feet about 40 miles west of Cape Sebastain.

Noteworthy Features

The other noteworthy features on the new map include part of an extensive ridge west of the valley rising over 3,100 feet from the bottom, and the southern tip of Heceta Bank, 35 miles west of Florence, which rises to within 167 feet of the water's surface.

The bathymetric map provides the most detailed bottom topography of the area published. It is one of a series planned by CGS for the seabeds off the Atlantic, Pacific, Alaskan, and Gulf coasts.



Area covered by bathymetric map (1308 N -17) of sea bottom off south Oregon, including vast undersea valley.

Maps Aid Development

The maps are designed to aid Federal, state, and industrial interests explore and develop the potential resources of the continental shelf. It is an area of approximately 862,000 square statute miles off the U. S. coasts. Economic development of these resources depends heavily on bottom topographic maps; few exist. Knowledge of the sea bottom is essential for marine engineering, scientific studies in recovering offshore oil and minerals, and to evaluate shoreline erosion and accretion.

Previous maps include the shelf off northern Oregon, southern California, the Aleutian Islands, northeastern Gulf of Maine, and the mid-Atlantic coast (from Cape Cod, Mass., to Chincoteague Bay, Md.).

Revised 'Mariner's Bible' for Pacific Coast Published

The 10th edition of U. S. Coast Pilot 7, the "mariner's bible" for the Pacific Coast and the first in 5 years, was published this month by the Coast and Geodetic Survey (CGS). The 380-page volume contains the latest information on the coast and harbors of California, Oregon, Washington, and Hawaii. The agency spent a year conducting an on-the-spot inspection.

The book has served mariners for more than a century. It includes greatly expanded information on port facilities at some of the most important U. S. Pacific harbors, including San Diego, Los Angeles, Long Beach, San Francisco, Portland, Seattle, Tacoma, and Honolulu.

There is detailed information on wharves, cargo-handling equipment, depths alongside wharves, available storage area, etc. Small craft information has been increased. The emphasis is on the transient boatman away from his usual cruising area.

8 Coast Pilots

CGS publishes eight coast Pilots covering all U. S. coastal and intercoastal waters. New editions appear about every 5 years.

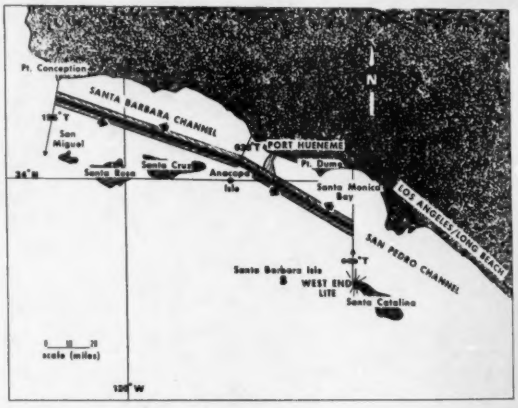
Generally, the book furnishes information that cannot be shown graphically on marine charts, such as navigation regulations, outstanding landmarks, channel and anchorage peculiarities, dangers, weather, ice, freshets, routes, pilotage, and port facilities. Cumulative supplements, containing changes, are published early each year.

Coast Pilot 7 describes the numerous bays, harbors, and rivers along the coasts of California, Oregon, and Washington. It also describes the offshore Channel Islands of southern California, the Sacramento and San Joaquin Rivers and their delta region, the Columbia River, and the large "inland sea" comprised of the Straits of Juan de Fuca and Georgia, and Puget Sound. A chapter on Hawaii describes the 8 larger islands and many small outer islands of the Archipelago.

The new edition costs $2.50. Available from the Coast and Geodetic Survey (C44), Rockville, Md. 20852, or from CGS sales agents. Annual supplements are distributed free.

Coast Guard to Set up Sealanes in Southern California

The U. S. Coast Guard has established coastwise sealanes in Southern California from Point Conception thru the Santa Barbara Channel to Santa Monica Bay. The new sealanes, effective Jan. 1, 1969, will provide safe passage thru areas of potential oil exploration and minimize risk of collisions. Similar plans already operate in New York, Delaware Bay, and San Francisco.



The sealane idea is similar to the divided highway of land transportation. The sealane is composed of 2 lanes, each one-mile wide, with traffic flow in opposite directions, separated by a "buffer" zone 2 miles wide. This idea has had good results on the Great Lakes since 1911. With the cooperation of domestic and foreign shipping lines, the risk of collision will be held to a minimum.

An overall plan includes a system of coastwise lanes extending from Point Conception to San Diego and linking the ports of Los Angeles/Long Beach, Port Hueneme, and San Diego.

Foreign Fishing Off U. S. in September

NORTHWEST ATLANTIC

One hundred and sixty-nine fishing and support vessels from the USSR, Poland, East and West Germany and Romania, were sighted in September, 44 fewer than in August. Such a decrease, due mostly to the departure of small Soviet side trawlers, is normal at this time.

Soviet: Soviet vessels--32 factory stern trawlers and 56 medium side trawlers--were observed fishing intensively along the 40- and 50-fathom curve, from Cultivator Shoals to the northern edge of Georges Bank, taking moderate amounts of herring and mackerel.

Polish: Polish vessels, about 35 in August, decreased to 24--9 stern trawlers and 15 large side trawlers fishing herring on the northern edge of Georges Bank. In September 1967, 38 Polish trawlers and support vessels were sighted there.

East Germany: The fleet, 31 vessels in August, decreased to 20 in September. Nineteen freezer stern trawlers and 1 factoryship were fishing herring east of Cape Cod and Nantucket, and on the northern edge of Georges Bank. In September 1967, 11 East German trawlers were sighted on Georges Bank.

West German: Fourteen freezer stern trawlers and 7 side trawlers (2 pair trawling) were observed fishing in the same general area as the East Germans. Only 4 stern trawlers were sighted in September last year.

Fishing in the Contiguous Zone

Special Coast Guard Sea and sea patrols were instituted early in the month. As exact measuring is very difficult, due to the lack of good shore line features, reports of foreign vessels fishing inside the 12-mile zone could not be confirmed.

GULF OF MEXICO, SOUTH ATLANTIC, AND CALIFORNIA

No foreign vessels were sighted in September. Reports of a Japanese long-liner fishing south of San Clemente Island were not confirmed.

PACIFIC NORTHWEST

Thirty-three Soviet vessels were sighted during September--25 large stern trawlers and 8 processing and support vessels. Light catches were observed aboard vessels fishing off Washington in the first half of the month; in the second half, when fishing had switched to off Oregon, good catches of Pacific hake were observed.

The nature of Soviet hake fishing has changed considerably this year. In 1966 and

Fig. 1 -"Ryanyy," whale catcher ship. This type of vessel highly maneuverable and capable of 18-20 knots. It is 208 feet long. (BCF/Crosby)

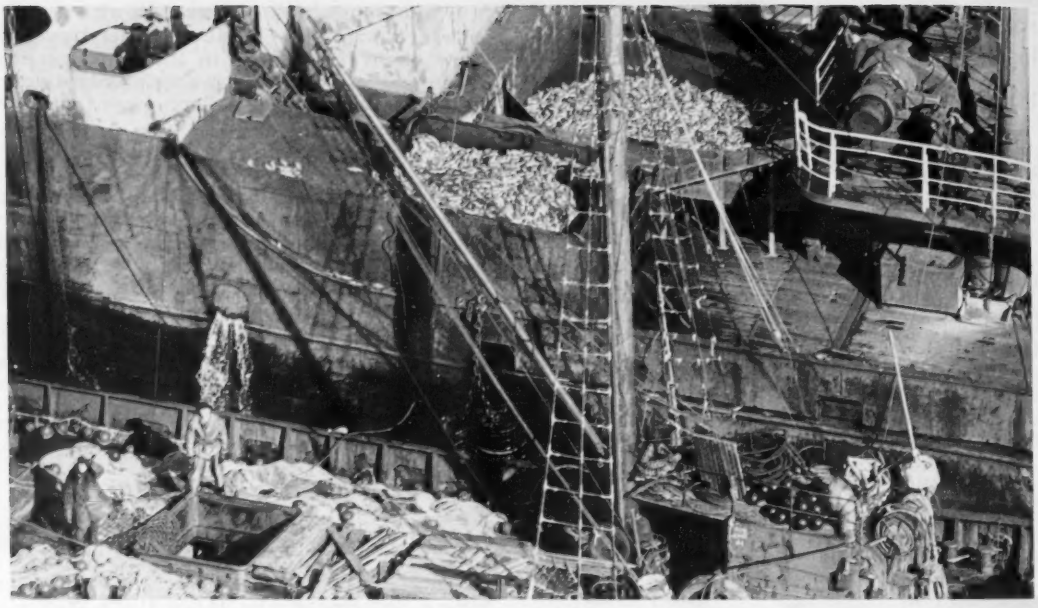


Fig. 2 - Unloading Pacific ocean perch from the "SRT Som" to the refrigerator reefer ship "Evaron." Note perch in bins aboard Evaron. (BCF/Branson)

1967, vessels were mostly medium side trawlers; this year there were more stern than side trawlers. There is evidence that experimental pair trawling with medium trawlers has not proved successful. Over 180 vessels were sighted in 1966 and 1967, compared to only 86 this year, but because of the greater efficiency of stern trawlers, the smaller number does not mean that Soviet hake catches will decrease.

ALASKA

Soviet: Soviet vessels fishing off Alaska fluctuated between 20 and 30, about half the number sighted in September last year.

Six stern trawlers along the Aleutians, and 2 in the Gulf of Alaska, fished for ocean perch. Ten medium trawlers fishing for pollock, flatfish, perch, and gray cod, along the Continental Shelf edge in the eastern and central Bering Sea, ended the fishery in mid-September. One whale catcher, sighted in central Bering Sea, is believed to have belonged to a fleet of 8 catchers and 1 factoryship.

Japanese: The 180 Japanese vessels observed during September had dropped to 130 by the end of the month because of declining ocean perch and minced meat and meal fisheries. A drop in effort in ocean perch fisheries is typical for that time of year. At mid-month, there were 6 factoryship fleets in the minced meat and meal fishery in the eastern and central Bering Sea; one returned to Japan at month's end, while the remaining 5 factoryships and 91 trawlers, spread out on the Continental Shelf, north of the eastern Aleutians and Alaska Peninsula, to northwest of the Pribilofs.

The 2 king crab factoryship fleets on the Continental Shelf, north of Port Moller, will stay on into October to take advantage of the high catches of tanner crab. One combination processing and fishing vessel, observed fishing tanner crab in the central Bering Sea in July, was sighted there again, presumably still fishing tanner crab.

The 9 vessels long-lining for sablefish in the Gulf of Alaska had decreased to only 1 or 2 by the end of the month.

Two stern trawlers fishing shrimp near Two-Headed Island, off southwest Kodiak Island, ended their operations by mid-September.

Note: During surveillance patrols, vessels are sighted, recorded, and identified as to type. Vessels are counted only once; if a vessel was sighted more than once it is counted as only one vessel, excluding duplicate sightings. Since vessels continuously arrive and depart, the total number of identified vessels for the month will always be larger than the actual size of the fishing fleets observed.

STATES

Alaska

SALMON CATCH IS 88% ABOVE 1967

BCF Juneau provides this summary of 1968 fishery developments in Alaska: The 1968 salmon catch is estimated at 260 million pounds with an exvessel value of $37.5 million--up 88 percent in volume and 52 percent in value over 1967.

King salmon landings remained relatively stable at 11.5 million pounds worth $3 million.

Chum salmon landings of 75 million pounds were the highest since 1944; the value of $7.5 million set a record.

Coho salmon landings of 18.5 million pounds were the highest since 1964, and the $4.5 million value a record.

The red salmon pack of 207,694 cases in Western Alaska was the lowest since the fishery began.

Pink salmon were large in number but small in size. They averaged 3 pounds per fish throughout Alaska.

Alaska salmon have more production and marketing opportunities because of modern transportation systems. For example: nearly 500,000 pounds of pinks were shipped from Prince William Sound to the supermarket trade, and frozen chum salmon have entered markets in Sweden and Japan.

Crab Landings

King crab landings of about 85 million pounds will be down 33 percent from 1967 landings of 127.7 million pounds. But value will set a record--up about 66 percent from $15 million to over $25 million.

On September 20, the Alaska Department of Fish and Game raised minimum size of king crab to 7 inches (carapace width) for all Alaska. Previously, minimum legal size had been $5\frac{3}{4}$ inches for Bering Sea area, and $6\frac{1}{2}$ for Aleutiian Islands area.

Dungeness crab landings in 1968 will approach 12 million pounds. These are slightly higher than 1967 landings of 11.6 million pounds, but increased exvessel prices will raise value 20 percent--from $1.5 to $1.8 million.

Tanner crab landings will top 3 million pounds in 1968; the 1967 catch was only 118,000 pounds.

Shrimp landings may be slightly less than in 1967. Estimates are for a year-end total of 40 million pounds, compared with 42 million pounds in 1967.

Scallop landings will hit 1.5 million pounds of meats with an exvessel value of $1.4 million. This is the first year scallops have been landed commercially.

* * *

SHELLFISH INDUSTRIES CONSOLIDATING

Ownership and management of the Alaska shellfish industry are changing. Shellfish operators in Alaska are mostly corporations with headquarters out of the state. Most often they are financially related to brokerage or marketing firms. Some have been engaged in salmon and other fisheries of Alaska for decades.

During the past 5 years, there have been consolidations of established shellfish packers with new entrants. Foreign operators, notably the giant Japanese firms Taiyo, Mitsubishi, and Nichiro, also have entered the industry. They did this usually by joint venturing with established domestic firms. The new domestic entrants, national rather than state level, are generally parts of the larger national food processing and marketing industry.

Recent Changes

Alaska's pioneer king-crab operation, Wakefield Fisheries, was sold recently to Hunt Wesson Foods, Inc., a subsidiary of Norton Simon, Inc. General Mills acquired Point Chehalis Packers with plants at Kodiak and Cordova. Mergers of nationally active firms include Ralson-Purina and Westgate-California Foods. For longer leriods, the national firms of Castel and Cooke, Vita Foods Inc., New England Fish Company, Nakat Packing Company (a subsidiary of A&P), and the

California Packing Corp. (or "Del Monte") through its subsidiary, the Alaska Packers Assoc., have been active in Alaska.

Regional Operators

Operators that are more regional in character (Pacific Northwest and Alaska) are Washington Fish and Oyster Co., Columbia-Wards, Pan-Alaska Fisheries, Ivar Wendt of Seattle ("Pacific Pearl"), Whitney-Fidalgo Seafoods, Kayler-Dahl, Petersburg Fisheries, and others.

* * *

MORE NATIVE RESIDENT ALASKANS HIRED

Alaska Commissioner of Labor Thomas J. Moore reports that "more Alaska natives worked in more jobs in more fish processing and canning plants in western Alaska in 1968 than in any other year in history." Moore attributes this sharp upsurge to a realization by cannery owners that it makes good sense to hire qualified local workers.

During the first 8 months of 1968, nearly 200 Eskimos were placed in fish processing and canning jobs in one small western community. Two years ago, only 70 Eskimos found jobs in the same community.

California

SAN PEDRO FISHERMEN'S INCOME DECLINES

From 1963 to 1967, the average annual income for fishermen in the San Pedro, Calif., fleet fell from about $4,600 to about $4,100. (The average family income in U. S. is $8,900.) During 1958-1968, the fleet decreased from 63 boats with a capacity of 5,745 tons to 28 boats with a 2,470-ton capacity. All vessels were built before 1945. These preliminary data were reported by William Perrin of the Operations Research program of BCF's Fishery-Oceanography Center.

High Cost of Replacing Fleet

Perrin visited the Seattle-Tacoma (Wash.) region to get estimates of how much it would cost to replace the San Diego wetfish seiners. He talked to representatives of 3 boatbuilding companies. While the estimated market value of the San Pedro vessels ranges from $20,000 to $60,000--estimates of the cost of building vessels to replace them range from $120,000 to $400,000, depending on size and equipment.

San Pedro is No. 1

In 1967, for the 19th consecutive year, San Pedro was the No. 1 U. S. port. Its landings were worth $28,598,000. In 1950, it set the all-time record for landings in a single season with 848 million pounds of fishery products.

* * *

FISHING INDUSTRY DOES NOT SHARE IN THRIVING ECONOMY

California's economy has been prospering for years, but the fishing industry and fleet have not shared its success. The somber story of the industry is outlined in the 1968 report of BCF's Fishery-Oceanography Center in La Jolla, Calif. The Center is dedicated to advancing basic fishery science--and to conducting research on problems relevant to fisheries in its area in order to improve them.

Resources and Problems

In 1966, the fish industry used as raw material about 250,000 metric tons of 50 species of fish and invertebrates worth $87 million. Of the total, 60,000 tons worth $32 million were caught by foreign vessels and transshipped to California processing plants. The imports were 22% of the total weight and 37% of the value.

By 1966, landings had declined to under a third of the 1939 figure. The tuna industry depended increasingly on foreign catches. In 1939, the California fleet's total catch was over 750,000 metric tons worth $18 million; only 3,000 additional tons were imported.

Many Causes

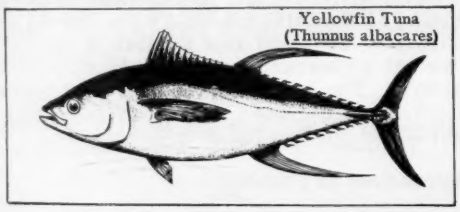
This decline "is the basis of the problem facing the California fish industry and its fishing fleet," states the La Jolla report. It continues: "Attributable to no single cause, the failure to participate in the generally rising prosperity of the California economy can be blamed on unwisely heavy fishing of

some resources, on natural changes in resource abundance due to climatic trends, and on increasing foreign competition in the tuna fisheries and in the fish meal and oil markets."

1939 vs. 1966

In both 1939 and 1966, the 5 main elements of the California fisheries were tuna, salmon, industrial fish, fresh fish, and invertebrates.

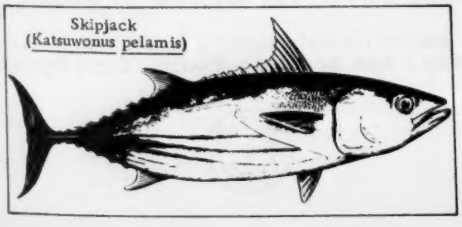
By 1966, tuna landings had increased about 33% over 1939. Yellowfin tuna (Thunnus albacares) dominated in 1966 as in 1939; the proportions of the other species remained about the same. In 1939, canners imported only 3,178 tons; by 1966, imports were 60,832 tons. These imports were 45% of the value of raw materials used by processors; in 1939, the figure was only 5%.


Yellowfin Tuna
(Thunnus albacares)

By the early 1960s, researchers realized that stocks of yellowfin tuna had reached their maximum sustainable harvest. In 1966, the yellowfin were brought under effective international regulation for the first time.

Underutilized Tuna Species

With yellowfin tuna landings at a peak, it became important to increase the harvest of underutilized tuna species--or imports would continue to spiral. The La Jolla report states: "Fortunately, it appears possible that the skipjack tuna (Katsuwonus pelamis) population and perhaps those of the temperate tunas are not fully harvested and ways of increasing the take of these species by California vessels are now being studied within the Fishery-Oceanography Center."


Skipjack
(Katsuwonus pelamis)

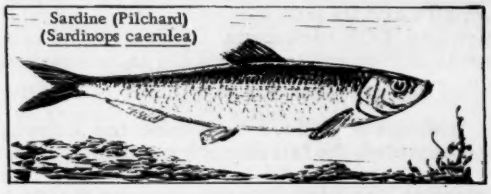
Salmon Fishery Stable

The salmon fishery off Northern California has been stable since the late 1930s. The value of landings has increased.

Industrial Fishery Troubled

The industrial fishery ("wetfish fishery") is worst off. It uses pelagic speci.. of the California Current. These are reduced to fish meal and oil--canned as inexpensive canned products (mostly for export) and processed into animal foods. This fishery declined from great prosperity in the 1930s and 1940s to current despair. In 1939, landings topped 500,000 tons; by 1966, they had dropped to about 60,000 tons.

The decline is attributed mostly to the collapse of the northern subpopulation of the Pacific sardine (Sardinops caerulea). This began during the 1940s and hit bottom in the 1950s. In 1939 sardine landings were 500,000 tons--79% by weight and 34% by value of all landings; in 1966, they were only a few hundred tons.


Sardine (Pilchard)
(Sardinops caerulea)

Fresh Fish

The fishery for fresh fish is less depressed than the industrial fishery. The landings in 1966 were about the same as in 1939, but their value was higher.

Fishery for Invertebrates

The fishery for invertebrates has remained a minor one in California's total fishery economy. This is true despite the more than twofold increase in landings--due mostly to increased exploitation of squid and market crab.

Oregon

FALL CHINOOK RUN PAST
WILLAMETTE FALLS SETS RECORD

A record 4,260 fall chinook conquered Willamette Falls, historic barrier to spawning salmon in the Willamette Basin, in 1968, the Oregon Fish Commission has announced.

The number passing over the cul-de-sac portion of the multimillion dollar Willamette Falls fishway, together with the old ladder, was more than double the 1967 count. Most fish used the new cul-de-sac fishway. This was reported by Roy Sams, project leader on the Columbia River Watershed Development Program.

Small But Significant Number

The number of fish, though relatively small, is significant, Sams emphasized. He noted that the fledgling upriver run has built up steadily from the period when the fall chinook faced virtually impassable conditions. Recent aerial surveys of the Willamette and its tributaries by Fish Commission and BCF biologists attest that the majority of fish getting above the falls spawned successfully.

Biologists believe that once the fishway is completed, the fall chinook run could expand eventually to over 90,000. To develop this potential, the Fish Commission and the Fish and Wildlife Service have planted millions of juvenile fall chinook in the Willamette system since 1963.

Sams said the development of a 90,000 run could be speeded greatly with money to expand the present salmon pond rearing program in the Willamette Valley.

More Ponds Proposed

The Fish Commission is pleased with the successful rearing program conducted at the Salem Cascades Gateway Park in 1968. It has proposed 4 more pond rearing sites. These and the Salem pond could produce annually 25 million fall chinook smolts. The ponds would be located on the Molalla, North Santiam, South Santiam, and on the main stem Willamette near Eugene.

How successful the pond rearing program will be depends on the return of adult fall chinook; the first are expected in 1970.

Texas

HYBRID SUNFISH EXPERIMENTS
ARE SUCCESSFUL

The Texas Parks and Wildlife Department may have a solution to sunfish overpopulation in lakes and ponds: a hybrid sunfish. It is a cross between the female redear and the male green sunfish. The hybrids grow much faster than their parents and have only a fraction of their reproductive capacity.

Harmon Henderson, fish hatchery superintendent at San Marcos where the hybrid was developed, says the new sunfish is unique in physical appearance and as beautiful as its parents. The hatchery began experimenting in 1963 with the possibilities of producing a hybridized sunfish for stocking ponds.

Approaches to Problem

According to Henderson, the problem with normal sunfish is that one female may produce 12,000 to 65,000 eggs. The population explosion produces too many fish that cannot grow.

Henderson notes various methods used to control sunfish populations, including rotenone treatments of ponds and seining. Ponds with controlled water levels have been lowered sufficiently to expose sunfish nests and eggs to air in order to destroy them.

Hybrids May Be Answer

These measures are not needed with the hybrid. The hybrid are reproduced at a ratio of 4 males to 1 female. An experimental pond, drained after hybrid eggs hatched, had an average of only 300 offspring per female.

Experimental stocking of hybrids in farm ponds has been successful. Some hybrids reached 2 pounds in 2 years.

BUREAU OF COMMERCIAL FISHERIES PROGRAMS

'Delaware II' Replaces 'Delaware'

BCF Gloucester (Mass.) has a new research vessel--the Delaware II. The vessel was delivered by the builder, South Portland Engineering Co., on October 4.

The Delaware II replaces the M/V Delaware, which will be sold by the General Services Administration in November. The new vessel will conduct exploratory fishing and gear research in the Northwest Atlantic--from Maine to Virginia--and in international waters off eastern Canada.

Delaware II

The vessel, which costs about $1,400,000, is 155½ feet long, has a service speed of 12.5 knots, can cruise 8,000 miles, and stay at sea a month.

She is equipped for stern trawling, side trawling, clam and scallop dredging, longlining, gill netting, and purse seining.

'Hybrid' Purse Seine Is Tested

BCF tested its fast-sinking, "hybrid" purse seine aboard the tuna purse seiner "Liberty" fishing off Oregon.

Although the Liberty was last to arrive on the fishing grounds, it was reported in mid-October to have caught more than the other vessels: 10 tons of bluefin tuna, 75 tons of albacore, and 60 tons of bonito.

Purse Seine Design Next

Enough was learned from making the net and testing it to go on to the next phase. This is the design of purse seines tailored to the net's length, depth, weight, and type of fishing planned for it.

Floating Trap Net in Oahe Reservoir Proves Effective

The effectiveness of a BCF-developed floating trap net used in Oahe Reservoir is surprising observers. The reservoir is on the Missouri River in South and North Dakota. During its first tests, the floating net took 33,043 pounds of buffalo fish in 187 lifts--177 pounds per lift. Conventional hoop nets took 30,285 pounds in 471 lifts--64 pounds per lift.

Other species, mostly carp and carpsucker, made up less than 10 pounds per floating net lift--and less than 13 pounds per hoop net lift.

'Undaunted' Receives Satellite Photos

BCF's Undaunted has become the first fishing vessel to receive television photos transmitted from the ESSA VI weather satellite. The research vessel is taking part in the international program to study the distribution and biology of surface tuna and other fish in west African waters.

Undaunted's Receiver

The Undaunted has an automatic picture transmission (ATP) satellite receiver aboard. It records the picture transmitted from the satellite passing overhead. It is expected that such information will help BCF scientists locate and track productive water masses. If successful, inexpensive APT satellite receivers could be placed aboard commercial fishing vessel.

'Point of No Return' for Larval Anchovies Is Found

At 22° C., anchovy larvae could go without food for 3 days after hatching--or between 36 and 60 hours after the yolk was exhausted--and still exhibit good survival if they received food by noon of the third day. But if feeding was postponed until fourth day after hatching,

nearly all larvae died of starvation. Their survival curves were almost identical to those of control group that was not fed. This was learned in an experiment by Rovert May, Biological Technician in the Behavior-Physiology program at the BCF Fishery-Oceanography Center at La Jolla, Calif.

The Experiment

Four groups of larvae were fed at successively later times after hatching; a fifth group not fed, served as control. Mr. May followed the mortality in each container daily at noon.

"These results imply that the period of yolk absorption in the life history of the northern anchovy is less critical in terms of survival than might have been expected."

Can Fish Schools Be Spotted from Space?

During the Apollo 7 flight, BCF's "Oregon II" released Rhodamine B dyes and fish oils into the Yucatan Channel. It was part of a program to evaluate observations made from space. The observations may prove useful in detecting and assessing fish schools.

A Coast Guard plane flying between 400 and 10,000 feet photographed the waters in which the dyes and oils were released. These photos will be compared with those taken from the Apollo spacecraft.

La Jolla's 'Advisories' Benefit Fishermen

The Fishery-Oceanography Center at La Jolla, Calif., continued in September its successful daily albacore fishing information broadcasts and 15-day bulletin series. Albacore production continued to swell the record for the Pacific Northwest, especially for Oregon.

The La Jolla staff reports: "Our advisory services have earned a considerable number of favorable responses this season. When San Diego fishermen's wives telephone us for

a last-minute verbal appraisal to be relayed to their husbands who are pointing into 30-knot winds and 8-foot seas off Oregon at the time--we can only conclude that our service activities are hitting the mark!"

Scientists Bug Salmon

Salmon and steelhead trout have fallen prey to--spies.

For several years, James H. Johnson of the BCF Biological Laboratory in Seattle, Wash., and his crew of fishery researchers have been snooping into the habits of these species. The effectiveness of the sonic tags with hydrophone receivers developed in their Seattle electronics shop have led to a wave of spying by other scientists on a number of other marine species. Johnson has helped marine behavior studies from Canada to the Caribbean and from lobsters to humpback whale.

Tool for Migration Studies

The sonic tag and the hydrophone monitors that pick up its signal were developed as a tool to study migration of salmon and steelhead on the Columbia River.

The University of Wisconsin borrowed Johnson and his tracking boat for a salmon "homing" project. The team tracked one pink salmon over 50 miles--from Friday Harbor in the San Juan Islands of Washington State toward his home in British Columbia. The sonic-tagged salmon took a long way home. (Perhaps it was trying to shake the snoops.)

Other Species Tracked

Shore monitors and technical assistance were provided the Fisheries Research Board of Canada to obtain data from sonic-tagged Atlantic lobsters. The Canadians hope to resettle this species off the coast of British Columbia. Similar equipment was loaned to track shad in the Connecticut River, and bull shark in the Rio San Juan of Costa Rica.

Once, Johnson went to Bermuda to join a team of scientists from Rockefeller University and Woods Hole Oceanographic Institution in an attempt to attach sonic tags to humpback whales. The whales outwitted the biologists at every turn. Finally, when tags were attached, the whales quickly brushed them off with a flick of their flippers.

BCF Bugging Since 1955

BCF has been bugging salmon since 1955, when the first crude tag and receiving equipment were developed. The tag was nearly 5 inches long, 2 inches in diameter, and transmitted for about 8 hours. Since then, miniature transmission packages have been developed. These make it possible to reduce tag size to about one fourth its original bulk and increase transmission time to 3 months. Originally, tags were attached to a salmon's back, where they frequently tore loose. Now they can be inserted in the stomach, where they have been known to remain until the salmon dies after spawning.

Study Fish Loss Between Dams

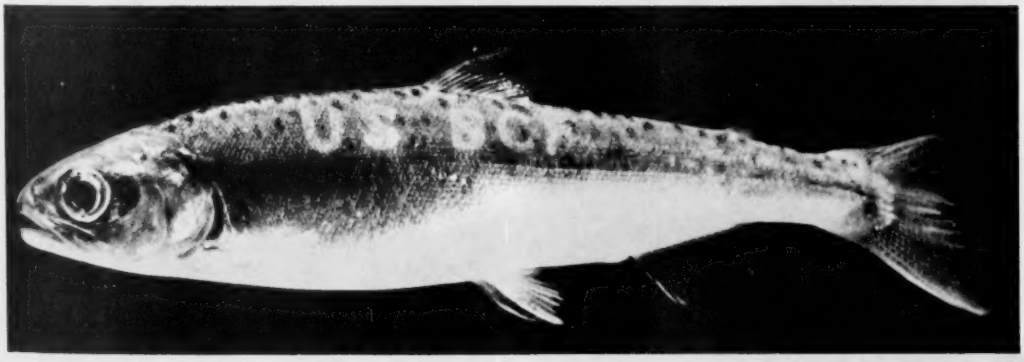
The last sounds heard from Johnson and his crew of biologists and technicians indicated they were completing a 2-year study aimed at finding the reason numbers of salmon and steelhead trout disappear between major dams on the Columbia River. The biologists are determined to find the answer. In this sense, the studies aim to help the fish; in another, sonic research on salmon behavior in the sea may lead to more effective means to capture them.

A Salmon You Can Call Your Own

A simple method to brand young salmon for research purposes was developed and has been used for the past few years by BCF biologists in Seattle, Wash., and Auke Bay, Alaska. Fish branding is being used in studies of growth, behavior, migration patterns, and survival of young fish. Also, it may be used to identify and measure the contributions of many different stocks of the salmon fishery.

The branding irons are small and made of copper or brass. Their tips are solid silver to provide the most efficient transfer of heat. The irons either may be heated in boiling water (212° F.) or chilled with liquid nitrogen (-324° F.) for "freeze branding."

The irons are held lightly against the skin of an anesthetized salmon for about one second. The heated or chilled iron marks the fish with a visible brand that grows with the fish and can last its lifetime.



Many marks or combinations can be used so that individual fish or groups can be recognized easily by their own brands over long periods.

Culture of Oysters Off Bottom Advances

For the past dozen years, BCF has been experimenting with the off-bottom culture of oysters (Crassostrea virginica) along the U. S. east coast. Early studies at Cape Cod, Mass., showed that oysters suspended off bottom improved in "growth, survival, and quality."

Later studies in Chesapeake Bay showed excellent oyster sets can be obtained by suspending shells from rafts. In 1965, in one area, over 20 oyster spat per shell were collected on suspended shells; this compared with 5 spat per shell on the bottom.

At the BCF Biological Laboratory at Oxford, Maryland, studies include the off-bottom culture of oysters in natural and man-made ponds. William N. Shaw has reported "preliminary findings indicate that natural ponds are excellent for growing and fattening oysters, and artificial ponds can be used to produce seed oysters . . . the off-bottom culture of oysters appears to have commercial application along the Atlantic coast."

The photos show aspects of off-bottom oyster culture in Massachusetts and Maryland.

Fig. 1 - Four $\frac{1}{4}$-acre, man-made, salt-water ponds in front of BCF Biological Laboratory, Oxford, Md. Built above sea level, each pond is about 75 feet by 145 feet by 3.3 feet deep. Each holds about 312,500 gallons of water. The ponds have clay bottoms and sides. Dual pipe and pump systems permit weekly alternations and flushing to prevent fouling.

Oysters are being grown in these ponds. Some are on strings and suspended from rafts. (Photo: Robert Williams.)

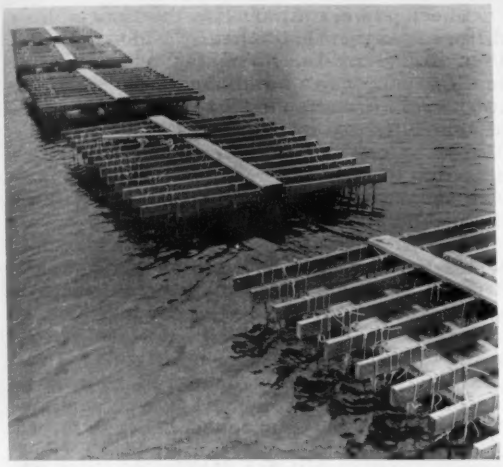


Fig. 2 - Styrofoam rafts in Broad Creek, eastern shore of Chesapeake Bay, Maryland. Strings and bags of shells are suspended from rafts to catch seed oysters. The rafts then can be towed to growing area.

Fig. 3 - Strings attached to rigid structure. Growing on the strings are shells with oysters attached.

Fig. 4 - String of 1-year-old oysters grown from raft in Oyster Pond River, Chatham, Mass.

Fig. 5 - 2-year-old oysters grown from raft in Taylors Pond, Chatham, Mass.

'Cromwell's' Sonar Tracks Tuna Schools

A major mission of a cruise by the Townsend Cromwell in Hawaiian waters (No. 38, 8/14-9/13) was to collect data from CTFM sonar on movements of tuna schools and on their environment to investigate the association between them. (CTFM is continuous-transmission, frequency-modulated sonar.)

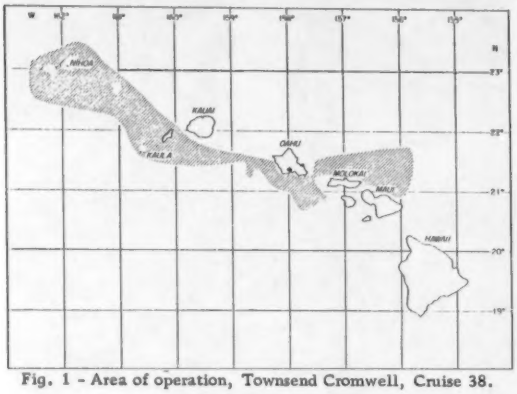


Fig. 1 - Area of operation, Townsend Cromwell, Cruise 38.

Nine tuna schools were contacted by the sonar: 3 medium skipjack tuna (8-12 lbs.), 4 small skipjack tuna (less than 4 lbs.), one medium yellowfin tuna (30-60 lbs.), and one was a mixed school of skipjack and yellowfin (8-12 lbs.). The schools were tracked by a combination of visual and acoustic means. Tracking ranged from 4 to 118 minutes, with a mean of 61 minutes. Bathythermograph samples were taken with each school. The salinity-temperature-depth recording equipment was not available throughout the cruise.

Ultrasonic Tags Used

A second major mission was to tag large fish with an ultrasonic tag and track with CTFM sonar.

Seven yellowfin tuna and one little tunny were tagged. The tags were cylindrical, ultrasonic ones 3 inches long, $1\frac{1}{8}$ inches in diameter, and emitting a pulse of 37 kHz (±200 Hz) at a rate of 1 per second. All fish were caught trolling on the banks near Nihoa Island and ranged in size from 50 to 80 cm. The selected fish were tagged immediately after capture, then released.

The tags were attached to the fish in three different ways: 1) attached by a monofilament line. A 35-cm. line, with tag attached at trailing end, was tied to caudal peduncle. 2) two hooks were attached to tag. The first was attached firmly to tag; the second was connected at end of a rubber band in a position opposing the first. The firmly attached hook was inserted at base of first dorsal fin, and the second hook was placed at base of second dorsal fin under tension of the rubber band. 3) tag was inserted into stomach via mouth. After 2 unsuccessful attempts--in which it was assumed tags had been regurgitated--4 prongs lined with plastic were attached firmly to tag to make regurgitation difficult. A reflex swallowing action occurred as soon as tag touched fish's throat and tag was partially swallowed. A tag's exposed end was forced the remainder of the way into stomach with a narrow pole.

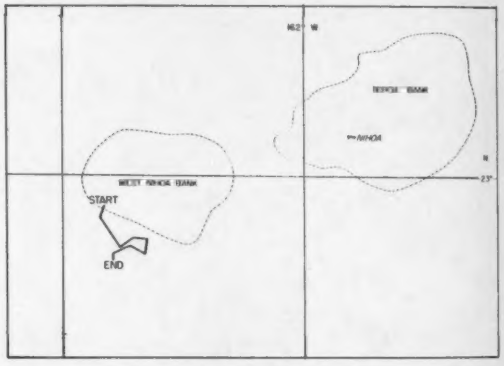


Fig. 2 - Path of tagged yellowfin.

Tracking Tags

A 40-50 cm. little tunny was tagged by the first method and tracked for 2 hours 11 minutes. Contact with the tag was lost at the bottom of the sea. The second method was attempted with a 75-85 cm. yellowfin. Contact terminated after 44 minutes, when the tag dropped rapidly to the bottom. Two 50-65 cm. yellowfin were tracked using the third method (without prongs). One fish was followed for 33 minutes, and the other only 1 minute. Contact was terminated in each case after tag was observed on sonar to drop rapidly to bottom. It was assumed the tags had been regurgitated. The first 2 yellowfin (80-90 cm.) that were tagged internally with the

modified tags were tracked for 6 and 23 minutes, respectively. Contact with tags ended while fish were still in midwater. It was assumed that either fish swam out of range or malfunction occurred in the sonar. Two more yellowfin (60-80 cm.) were tracked with modified tags for 5 hours and 58 minutes and for 7 hours and 54 minutes (fig. 2). In first case, tracking was discontinued after tag settled to bottom. The ship was anchored near tag, and the tag was still audible the following morning, 19 hours after it had been activated. In the second instance, contact with tag was lost shortly after fish began to sink to a 1,000-fathom depth.

'Jordan' Conducts Pacific Albacore Survey

The R/V David Starr Jordan cruised the waters off California and Oregon from mid-July to mid-August "to establish the distribution and availability of albacore in offshore waters during the middle of the Pacific coast season--and to test prospects for commercial exploitation of albacore beyond the traditional limits of the fishery (beyond 300 miles from shore)." (Cruise 26.) She covered 5,340 miles.

Albacore were taken every day in the survey grid, although fishing was not continuous throughout daylight hours because of schedule limitations. The computed catch-per-effort data gave good indications of commercial fishing potential from the easternmost line--127° W., to 131° W.--and between 40° and 45° N. in second-half July. Another good area was near 46° N., 127° W. in the second week of August.

Considering 100 fish per 100 line-hours to be the minimum for good commercial trolling (100 fish per day), there were 6 days out of 23 and 3 more that exceeded 90 fish per 100 line-hours.

Water & Tuna Body Temperatures

Gary Sharp of the Population Dynamics Program conducted a physiological experiment in which 450 blood samples were taken and 46 albacore body temperatures were recorded. Body temperature was lowest when albacore were caught in waters having temperatures within the optimal catch-temperature range (62°-64° F.). "This is the first physiological evidence that corroborates the frequency vs. catch-temperature relationship derived from fishermen's logbooks over a 5-year period."

The sea-surface temperature in most of the survey grid encompassed a small range from 16.5° to 18.0° C. (61.7° to 64.4° F.). Fishermen's logbook records show that the major part of the commercial catch is taken in these temperatures. The thermocline was relatively shallow, between 20 and 30 meters. Except for the initial northbound leg (127° W.), the weather was fair and sunny with light winds offshore, but the coastal region had occasional strong northerly winds. The observed currents were very weak and were directed eastward at 135° W., and southward nearer shore.

'Jordan' Follows Fish Schools With Radar & Sonar

The David Starr Jordan cruised the waters off California (cruise 28) from Sept. 23-27 primarily to follow fish schools with the Decca radar-plotter and Simrad sonar and establish swimming speed of fish. This would be compared and evaluated with laboratory speeds and respiration studies.

The scientists developed a technique whereby fish schools could be positioned on the oscilloscope screen and tracking achieved by coordinated operation of sonar operator and captain. Ship speed was maintained at about $1\frac{1}{2}$ knots and the fish school was kept at a heading to port side of vessel. The school was never permitted to get behind the ship, where the wake interferes with viewing. The distance from ship was recorded on the 30 kHz recorder. The following information was taken at intervals while school was in view: time of observation, distance to school, heading of school from due north, or some other bearing, and declination of Simrad transducer.

At the time of observations, the plotter was manually operated to indicate the point on a chart relative to all other positions.

What Scientists Found

The BCF La Jolla scientists reported: "We found that the Decca radar could be used by accurately positioning the ship between two points of land. An accuracy of measurement to 200 ft. or better was easy to maintain by manually dialing the plotter, keeping the two points of land positioned on the preset standardized concentric ring of the radar. Our best position was maintained between 'Ship Rock,' Catalina Island and Pt. Fermin on the mainland. The best area of operation was the lee of Santa Catalina Island because targets were always available except at night.

"The recorder of the sonar was extremely important because it provided a visual picture of the distance of the school from the ship." Also, it provided a continuity with time, so if school was lost momentarily on oscilloscope screen, the pick-up again could be verified by reference to the previous target mark on the recorder.

The scientists added: "We attempted two methods to identify the fish we were tracking--the first of these, dynamite, half pound to 1½-pound charges, exploded at the surface and at various depths to 100 m, was unsuccessful. No fish appeared at the surface after its use. The second method--a television camera maintained in the bow chamber--was similarly unsuccessful because the fish were either too deep or avoided the vessel." In one instance, the captain saw the anchovy school the scientists were tracking.

Results and Conclusions

The scientists concluded: "Once we familiarized ourselves with the potentialities of the equipment, we found that it was a simple matter for a team of two people to keep contact with a fish school for virtually any period desired throughout the day. The maximum time we followed any school was 2 hours and it seems certain that this could have been done for the entire day. . .no schools could be seen at night from about 1800 on. . . . Target identification remains the essential item of information still unknown."

'Delaware' Surveys Northern Shrimp in W. Gulf of Maine

The Delaware returned to Gloucester, Mass., on Sept. 13 after a summer shrimp survey in the western Gulf of Maine. (Cruise 68-8, Sept. 4-13, 1968.) The chart shows where concentrations of northern shrimp (Pandalus borealis) were found. This was the fourth in a series of cruises designed to collect data on the northern shrimp.

Otter trawl tows were made in 43 to 120 fathoms and caught 5 to 1,000 pounds of shrimp. Average size in individual catches varied from 36 to 50 per pound (whole shrimp).

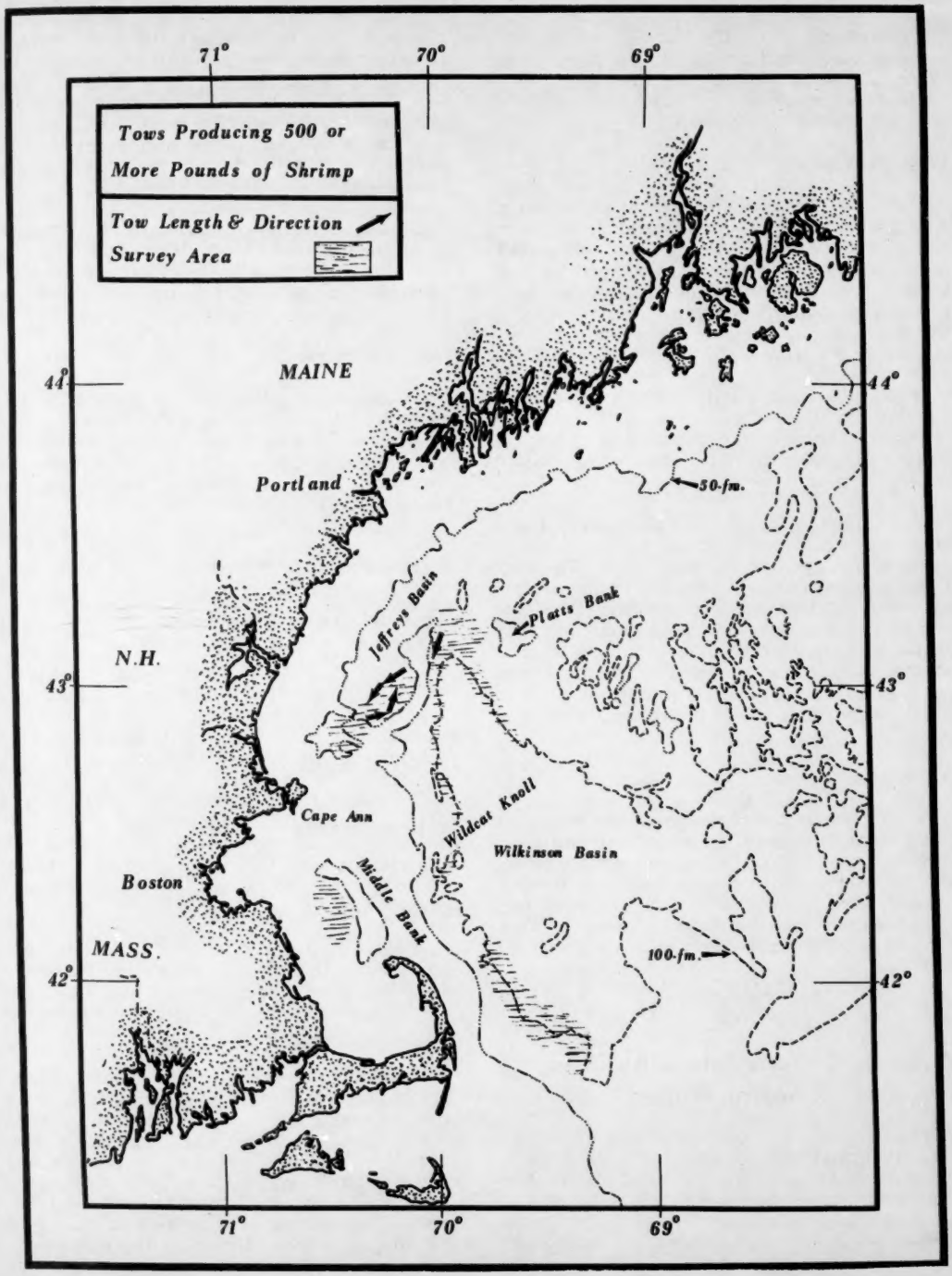
Procedure

A 70-foot, Maine-type, roller-rigged shrimp net was used for all fishing. Experience had shown that it was impractical to use a chain-rigged net in the sampling areas. All tows were 1 hour; they were shortened only because of hangups or soundings of very rough bottom. No exploratory try-net tows or night tows were made. Nighttime fishing for northern shrimp with bottom trawls proved unproductive during earlier cruises. Apparently, this was due to diurnal migrations of shrimp off the bottom during darkness. After each tow, data on catch size, pound count, and shrimp length were taken.

Results

Some shrimp were taken in each of the 37 tows completed. The average catch per tow was 220 pounds of shrimp, but 5 tows (14% of total) produced 500 pounds or more. This rate was about half the winter rate, when 30% of tows yielded 500 pounds or more of shrimps; it equals the 14% of the fall cruise and is 6% below the spring cruise figure. The length of shrimp varied from 11 to 34 millimeters; most were in mid-twenties range.

The best shrimp catch in the Middle Bank (Stellwagen Bank) area was 360 pounds. Catches of 1,000 pounds or more were made here during winter and spring surveys. Generally, the size of Middle Bank shrimp was the same as before--40 to 50 whole shrimp per pound. The percentage of egg-bearing female shrimp ranged from 91 to 54% and averaged 72% for all catches in this area. Trash fish and starfish were prevalent in all catches.


Tows Producing 500 or More Pounds of Shrimp
Tow Length & Direction
Survey Area
71°
70°
69°
44°
43°
42°
MAINE
N.H.
MASS.
Portland
Boston
Cape Ann
Jeffreys Basin
Platts Bank
Wildcat Knoll
Wilkinson Basin
Middle Bank
50-fm.
100-fm.

The catches from the Cape Cod area were considerably smaller than in the spring survey. The number of egg-bearers ranged from 32 to 40% and averaged 36%, considerably less than in other areas.

Wilkinson Basin

Fishing along western edge of Wilkinson Basin also was less productive than during spring cruise. One tow produced 500 pounds of shrimp and other catches ranged from 20 to 400 pounds. In the basin area, the size composition was about the same as in spring. The percentage of egg-bearers averaged 54% and ranged from 40 to 66% of all shrimp.

Better concentrations of shrimp were located north of Wilkinson Basin. Catches averaged 238 pounds compared to 137 in the Basin. However, the percentage of egg-bearing females was the same: 54%.

In the Jeffreys-Scantum Basin area, 4 of 8 tows caught 500 pounds or more. These catch rates about equaled spring rates. They indicated little change in population and distribution of shrimp since mid-May. The size composition was about the same as other areas, except for a small increase in proportion of larger shrimp. The percentage of egg-bearing females was higher than in other areas; it ranged from 60 to 95% and averaged 78%.

Other Species

Finfish were found to be generally abundant in all areas surveyed. In mixed catches containing many finfish, much of shrimp catch was crushed or softened by weight of fish in cod end. Moderate quantities of fish were removed easily from shrimp catches by the BCF-designed mechanical shrimp separator.

'Oregon' Collects Schoolfish Data in Atlantic Coastal Waters

The Oregon returned to St. Simons Island, Ga., on Sept. 17 after completing the fifth in a scheduled series of 6 bimonthly midwater schoolfish survey cruises in the Atlantic.

Purpose of the cruises is to obtain information on seasonal distribution and schooling density of pelagic (open sea) schoolfish in coastal waters (5 to 20 fathoms) between Cape Hatteras, N. C., and Jupiter Inlet, Fla. Schoolfish data are obtained along standard transect lines and analyzed on a quantitative basis to establish exploratory and experimental fishing patterns along the southeast coast.

Continuous high resolution vertical acoustical tracings were obtained on 26 standard transects. Surface-water temperatures and vertical temperature profiles were obtained on all transects. (See chart on page 31.)

Heaviest Schooling

Heaviest schooling was recorded off Florida, east of St. Augustine; off Georgia, east of St. Simons Island, Sapelo Island, and Savannah; off the Carolinas northeast of Cape Romain, south and southeast of Cape Fear, and south of Cape Lookout.

'Gilbert' Tests Live Baits for Skipjack Tuna

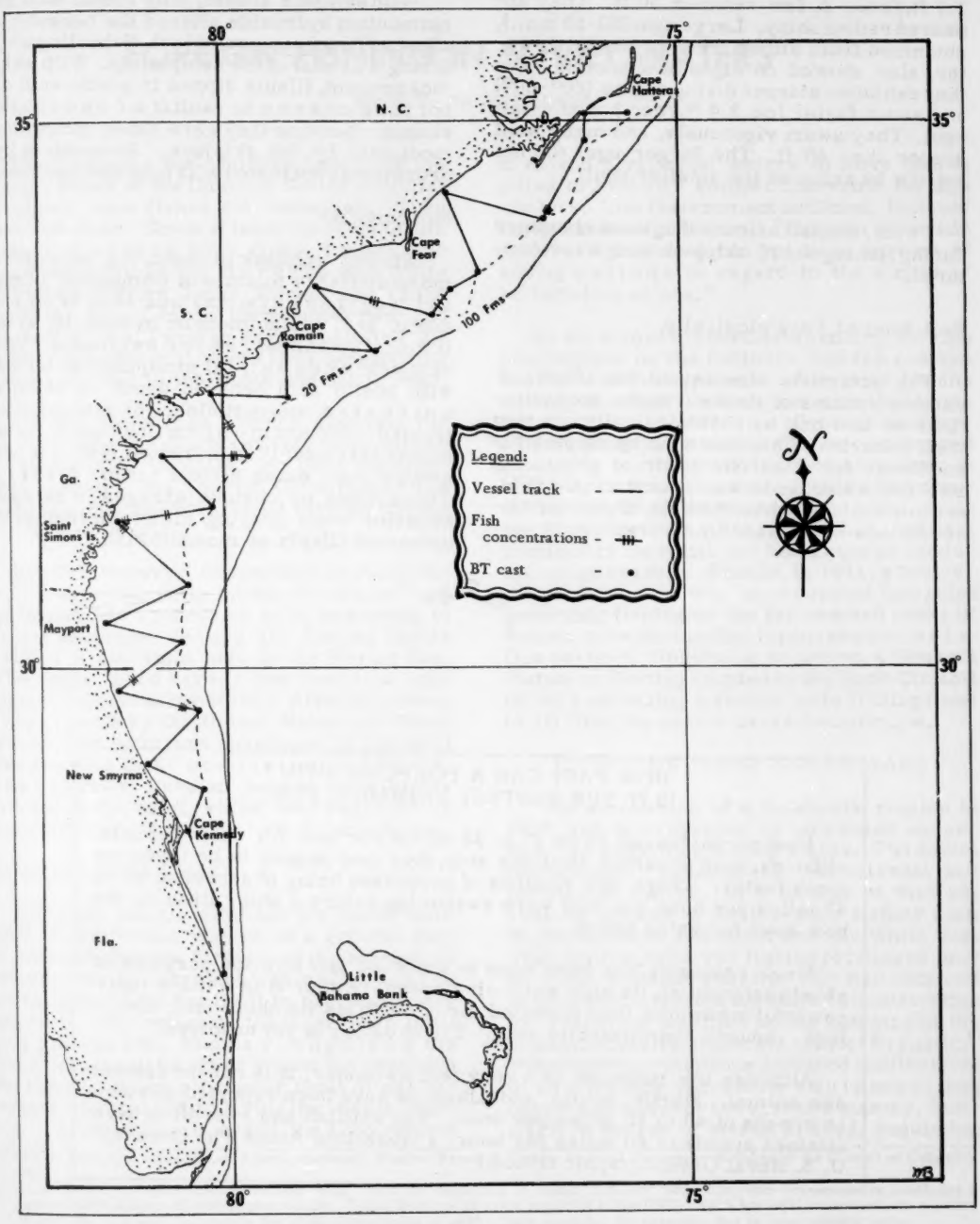
The Charles H. Gilbert cruised (No. 110) Hawaiian waters Aug. 21-Sept. 19 to test live baits in the pole-and-line fishery for skipjack tuna (Katsuwonus pelamis).

One bait tested was threadfin shad (Dorosoma petenense). Experimental pole-and-line fishing was conducted with 2 skipjack tuna schools using threadfin shad as bait, and with 4 schools using nehu (Stolephorus purpureus) as bait.

Seven schools of skipjack tuna were chummed with threadfin shad, and 9 schools with nehu. The success factor was 28.6 percent with shad, and 44.4 percent with nehu.

Ugui Tested

A second live bait tested was the ugui (Tribolodon hakonensis). Skipjack were absent and underwater observations were made by divers of ugui behavior when chummed from 100 percent fresh water and from brackish water (about 50% sea water). Small ugui (ca. 30-35 mm.) chummed from fresh water showed no signs of schooling or clumping together. Diving angles were estimated at 45°-60° and swimming speeds about



R/V Oregon Cruise 133, September 9-17, 1968.

1.1 ft./sec. A few reached 50 ft. They appeared rather shiny. Large ugui (50-55 mm.), chummed from either fresh or brackish water, also showed no signs of schooling. But they exhibited steeper diving angles (60°-80°) and swam faster (ca. 2.4 ft./sec.) than small ugui. They swam vigorously, and many went deeper than 40 ft. The larger ugui did not appear as shiny as the smaller ugui.

Twice, a small amount of ugi was chummed during fishing and 16 skipjack tuna were captured.

Bait Altered Physiologically

The scientists also tested the effects of various species of fishes (tilapia, mosquitofish) as live bait by physiologically altering their behavior. This was done by dipping the baitfishes for 1 second prior to chumming into hot water, cold water, acetic acid (5%), and ammonium hydroxide (5%). Behavior observations were made by divers.

With skipjack absent, only acetic acid and ammonium hydroxide altered the behavior of tilapia (Tilapia mossambica). Schooling while diving was disrupted completely. With skipjack present, tilapia dipped in acetic acid did not get a chance to exhibit a behavioral change--because they were eaten almost immediately by the skipjack. Ammonium hydroxide was not tested with predators present.

Mosquitofish

Without skipjack present, the behavior of mosquitofish (a mixture of Gambusia, Limia, and Mollienesia sp.) was altered only by acetic acid and ammonium hydroxide, which induced somewhat faster swimming. With skipjack present, (a) mosquitofish treated with acetic acid behaved about the same as untreated mosquitofish; (b) mosquitofish treated with ammonium hydroxide swam somewhat faster than untreated fish, but both groups were eaten almost immediately. There were no obvious changes in skipjack behavior when preying either on treated or untreated tilapia or mosquitofish.

HOW FAST CAN A PORPOISE SWIM?
IS IT THE FASTEST SWIMMING FISH?

Most porpoises can swim 17 to 23 miles per hour for short periods, although, to an observer aboard a ship, they may appear to be traveling much faster. There are records of porpoises being observed at 40 to 43 miles per hour, but they were swimming before a ship, utilizing the bow wave for extra speed.

Much research has been done to discover just how the porpoise is able to accomplish its high swimming speed. Either it is a much more powerful swimmer than expected, or it modifies its shape and, therefore, reduces hydrodynamic drag. The question is yet unsolved.

Although the porpoise is a very fast swimmer, it is not the fastest sea animal. Marlin, bonito, and albacore have been reported to swim at speeds of 40 to 50 miles per hour. The sailfish and swordfish have attained speeds of 60 miles per hour. ("Questions About The Oceans," U. S. Naval Oceanographic Office.)

ARTICLES

FOREIGN FISHING IN SOVIET WATERS

By William E. Butler*

The various nationalities inhabiting the coastal areas of the Union of Soviet Socialist Republics have fished for centuries. They were not alone. Since at least the seventeenth century, vessels from Great Britain and Scandinavia fished the Barents and White Seas; others from Japan, Korea, and China fished the Sea of Japan, the Okhotsk Sea, and the Bering Sea; Persian boats exploited the Caspian Sea; and still others from neighboring states operated in the Black and Baltic Seas.

Fishery resources seemed adequate for all, including the comparatively undeveloped Russian fishing industry. So until the nineteenth century, the Tsarist Government was relatively unconcerned about foreign fishing off Russian coasts.

By 1821, however, competition in seal fisheries was sufficiently intense to induce Tsar Alexander I to approve an edict reserving to Russia exclusive sealing and fishing rights within a 100-mile belt in the Bering Sea. (The "mile" used here is the Italian mile equal to 1.85185 kilometers.) After strenuous objections by the United States and Great Britain, the edict was abandoned in bilateral treaties with those countries in 1824-25. Thereafter, Russian jurists were highly critical of the edict, which they regarded as an unjustified extension of state jurisdiction.

Rejected 3-Mile Limit

Although Russia rejected the three-mile limit of territorial waters as a general rule of international law throughout the nineteenth century, the Government was reluctant to promulgate a broader limit to protect fishery interests. (By rejecting the three-mile limit as a general rule, Russia recognized the three-mile limit of other states but reserved the right to adopt a broader limit if her interests so required.) During the 1840's, Russian trading officials urged the Government to extend territorial waters to forty Italian miles to reduce competition from foreign whalers. The Government declined. It stated that protests would result "since no clear and uniform agreement has yet been arrived at among nations in regard to the limits of jurisdiction at sea."

By the turn of the twentieth century, foreign competition on the northern and far eastern coasts, and the expansion of Russian fishing activity in coastal waters, increased pressure for restrictive legislation. Commissions appointed to consider the question recommended extending the limit of territorial waters to six, ten, or twelve miles. In 1906 one committee urged that a twenty-mile limit along the Murmansk coast be established, and that portions of the White and Kara Seas be closed to foreign vessels. Finally, in 1911, a twelve-mile fishing zone was incorporated into rules governing fishing on the far eastern coast of Russia, notwithstanding Japanese protests. Due partly to diplomatic pressure, a General Statute on Fishing adopted by the State Council in 1913 extending a twelve-mile fishing limit to all Russian coasts never became law.

PERIOD BETWEEN WORLD WARS

The succession of a Bolshevik regime in 1917 was accompanied by increased assertiveness regarding fishing rights. The Soviet Government "nationalized" its internal and territorial waters. In a decree of May 24, 1921, it created a twelve-mile fishing zone on its northern sea coast and the White Sea. That decree reserved fishing privileges only to those Russian citizens who had obtained special permits from the Main Administration for Fisheries and the Fishing Industry of the Russian Socialist Federated Soviet Republic.[1/] Penalties for violations included confiscation of an offending vessel, its equipment and cargo, and fines for the vessel's master. Similarly, a decree of March 2, 1923, regulating

*Research Associate, Harvard Law School; Associate, Russian Research Center, Harvard University; Member of the District of Columbia Bar.

1/The USSR did not exist until December 1922, when the Republics of Russia, Ukraine, Belorussia, and Transcaucasia concluded a treaty establishing an all-union government. Today there are 15 union republics in the USSR. Each has legal competence to exercise jurisdiction in areas allocated by the USSR Constitution of 1936. Each republic, for example, has its own criminal code.

far eastern fisheries, annulled all prior treaties, concessions, contracts, and other conditions affecting fishing in the Sea of Japan, the Bering Sea, and the Okhotsk Sea. It established a twelve-mile fishing zone, thereby confirming the Russian decree of 1911. Limited access by foreigners to fishing grounds in the far east was permitted by auctioning parcels of the coastal area to the highest bidder in return for exclusive fishing privileges.

Other Soviet Measures

A decree on the Organization of the Fishing Economy of the RSFSR of September 1922, superseded by a 1927 statute, placed control over fisheries in virtually all portions of the sea coasts under the jurisdiction of the central authorities. Previously, local authorities had control over many such areas. Moreover, on February 2, 1926, the Soviet Union confirmed its adherence to the 1911 convention regulating sealing ratified by the Tsarist Government. Thus, within a few short years, the Soviet Government had taken vigorous measures to provide a legal basis for exclusive fishing rights within twelve miles of its coasts.

To appreciate the actual impact of Soviet fishing legislation, however, one must recall the international position of the USSR during the 1920's and 1930's. By 1921, the Soviet Union had just emerged from a debilitating civil war. It enjoyed little, if any, diplomatic support abroad. Soviet attempts to enforce the twelve-mile fishing zone in the north and far east produced sharp confrontations with Great Britain and Japan. Seizures and confiscations of British trawlers off Murmansk by Soviet patrol boats were countered by several diplomatic representations and intimations of naval reprisal. Confrontations with Scandinavian governments were less acrimonious because Soviet diplomacy soon found it desirable to conciliate neighboring states. Ultimately, the twelve-mile fishing zones created by the decrees were nullified in effect by bilateral treaties and informal agreements concluded with the protesting states.

Fishing Agreements

A provisional fishing agreement with Great Britain, May 22, 1930, permitted British fishing vessels to operate within three miles of the northern coasts of the USSR and in specified portions of the White Sea. The agreement expressly provided that it did not constitute recognition or nonrecognition of the Soviet claim to a twelve-mile zone. This privilege automatically extended to Germany and Norway by virtue of most-favored-nation provisions in trade and navigation treaties signed by the USSR in 1925 with those states. Finland and the Soviet Union had reached an agreement about reciprocal fishing rights in territorial waters in the Gulf of Finland in 1922. Agreements signed with Japan in 1925 and 1928 were revised and renewed through 1940. The Soviet-Japanese agreements followed extremely difficult negotiations, and their provisions were sorely tested while they were in force.

In 1935 the Soviet Union adopted a comprehensive decree on fishing in which exclusive fishing rights in all Soviet territorial waters were unequivocally asserted. This decree, however, did not supersede treaties then in effect, nor did it define or delimit territorial waters.

Caspian Sea Unique

The Caspian Sea has a unique legal regime. General norms of international law relating to fisheries do not extend to the Caspian, whose regime is governed by Soviet-Iranian treaties. In a 1921 treaty of friendship with Iran, the RSFSR abrogated all treaties, agreements, and conventions of the Tsarist Government and annulled Russian concession rights in the Caspian. A 1927 fisheries agreement set up a joint Soviet-Iranian Company and granted it special concession privileges to catch and process fish. The concession lasted for twenty-five years. Iran elected not to renew the arrangement in 1953. However, it is bound not to grant a concession with respect to these fisheries to a third state for an additional twenty-five years. Each state has reserved a ten-mile fishing zone adjacent to its shore for vessels under its own flag; outside these zones, fishing may be engaged in exclusively by Soviet and Iranian nationals. The entire sea is open to fishing vessels of both states except in these zones, an arrangement confirmed in a 1940 Soviet-Iranian treaty. There has been no indication whether Soviet offshore oil drilling (now being conducted as far as seventy miles from shore) in the Caspian beyond the ten-mile zone has interfered with Iranian fishing.

THE POSTWAR PERIOD

Fishing concessions in Soviet waters were difficult to obtain after 1945. Catapulted to the status of major power by the war, the USSR was not disposed to allow foreign fishermen to operate within its twelve-mile limit. With the incorporation of Latvia, Estonia, and Lithuania into the Soviet Union in 1940, the twelve-mile limit was extended to Baltic coastlines. Enforcement resulted in seizure of numerous Danish and Swedish vessels in the late 1940's and early 1950's. The 1930 agreement with Great Britain was denounced in 1953 and renewed temporarily for 1954 and 1955. A new five-year agreement with Britain, which entered into force in 1957 and was denounced by the Soviet Union in 1961, has not been renewed.

In the far east, Japan was unable to renew the prewar arrangements. Large-scale arrests of her fishermen and vessels allegedly within the Soviet twelve-mile limit strongly colored Soviet-Japanese postwar relations. A 1957 Soviet decree declared Peter the Great Bay to be Soviet internal waters closed to foreign fishing. It probably was motivated primarily by strategic reasons: the naval port of Vladivostok is situated in Peter the Great Bay. The decree deprived Japanese fishermen of a rich fishing area. As the stronger power, the USSR has been generally successful in maintaining the integrity of its fishing zone and in persuading the Japanese to restrict fishing in the Sea of Japan and the Okhotsk Sea.

Limited Foreign Rights

At the present time, there are three agreements between the Soviet Union and adjacent states which give foreign citizens limited fishing rights in Soviet territorial waters. Pursuant to a 1959 agreement with Finland, renewed in 1966, the USSR consented to permit Finnish citizens resident in certain communes adjacent to the Soviet border to fish and seal in delimited areas of Soviet territorial waters in the Gulf of Finland.

Under a 1962 agreement between the Soviet Union and Norway, the latter's fishermen are permitted to fish in Soviet territorial waters in the Varanger Fiord until October 31, 1970.

In 1963 the State Committee on Fisheries[2/] attached to the National Economic Council of the USSR concluded an agreement with the Japan Fisheries Association permitting certain fishermen to gather sea kale near the Island of Kaigara. The Association pays the Soviets 12,000 Japanese yen (US$33.33) for each participating vessel. Nonetheless, Japan has been unable to achieve a satisfactory arrangement to fish in Soviet territorial waters in the far east. The 1966 Soviet-Japanese consular convention, however, may improve the legal protection of Japanese fishermen who stray into Soviet territorial waters.

2/Renamed the (Soviet) Ministry of Fisheries in 1964.

Decree Concerns Conservation

In 1958 the Soviet Union adopted a Decree Concerning Conservation of Fishery Resources and the Regulation of Fishing in the Waters of the USSR. It supplanted the 1935 decree on fishing. Under the 1958 decree, all Soviet waters which are used or which may be used for the commercial extraction of fish and other marine life and growth, or which have significance for the reproduction of fishery stocks, constitute the economic fishery reserves of the USSR.

Soviet territorial waters, whose breadth was established at twelve miles by a 1960 Statute on the Protection of the State Boundary of the USSR, fall within the category of economic fishery reserve. They are closed to fishing, crabbing, or hunting of marine fur-bearing animals by foreign vessels, except as provided for by the international agreements discussed above. Foreign vessels violating this rule, or having permission to engage in fishing but conducting it in violation of the established rules, are subject to detention; persons guilty of so doing are subject to administrative and criminal penalties under USSR and union republic legislation. Articles 163-166, for example, of the 1960 RSFSR Criminal Code contain severe penalties for illegally engaging in fishing or other extractive trades, hunting seals or beavers, blasting in violation of rules protecting fish reserves, and illegal hunting.

CLOSED SEAS

As the cold war intensified after World War II, some Soviet jurists suggested the concept of the closed or regional sea as a theoretical justification for denying, or severely restricting, access by foreign vessels to seas contiguous to the USSR. The underlying

principle was that when certain geographic criteria were present, the regime of a given sea should be established exclusively by agreement of the contiguous states. This would also include rules governing fishing. Presumably, contiguous states would have the right to exclude the vessels of noncontiguous states from the closed sea. Soviet jurists have formulated the geographic criteria in such a manner that six of the fourteen seas washing Soviet coasts--the Okhotsk Sea, the Sea of Japan, the White Sea, the Baltic Sea, the Black Sea, and the Sea of Azov--would fall into the category of closed seas.

However, this theory has never been espoused by the Soviet Government. Yet it remains on the record as a distinctive Soviet contribution to legal theory relating to freedom of the seas. It may haunt Soviet diplomats in the future, when smaller powers invoke Soviet doctrine to justify exclusion of Soviet high-seas fishing fleets from their offshore fisheries.

Soviet high-seas fishing is a recent phenomenon post-dating most Soviet legislation and agreements discussed in the article. Soviet law is a product of the period when Soviet fishing was primarily coastal. Having established a pattern of limiting foreign access to Soviet waters, it remains to be seen how the Soviet Union will treat its own precedent when the same principle is invoked by other states.

LITERATURE CITED

BARABOLIA, P. D., et al
1966. Voenno-morskoi mezhdunarodno-pravovoi spravochnik (Naval International Law Manual). Voenizdat, Moskva (in Russian).

BUTLER, WILLIAM E.
1967. The Law of Soviet Territorial Waters: A Case Study of Maritime Legislation and Practice. Frederick A. Praeger, New York.

HARTINGH, FRANCE DE
1960. Les Conceptions Sovietiques du Droit de la Mer Soviet Concepts of the Law of the Sea). R. Pichon et R. Durand-Auzias, Paris (in French).

KOZHEVNIKOV, F. I., ed.
1966. Kurs mezhdunarodnogo prava (Textbook of International Law). 2d ed. rev. & enl. izd-vo IMO, Moskva (in Russian).

KURS MEZHDUNARODNOGO PRAVA V SHESTI TOMAKH, Vol. III
1967. Osnovnye instituty i otrasli sovremennogo mezhdunarodnogo prava (Basic Institutes and Branches of Contemporary International Law). izd-vo Nauka, Moskva (in Russian).

NIKOLAEV, A. N.
1954. Problema territorialnykh vod v mezhdunarodnom prave (Problem of Territorial Waters in International Law). Gosiurizdat, Moskva (in Russian).

ZHUDRO, A. K., et al
1964. Morskoe pravo (Maritime Law). izd-vo Morskoi transport, Moskva (in Russian).

WHAT IS THE VOLUME OF THE WORLD'S OCEANS?

Estimates vary from 317 to 330 million cubic miles; the most reliable sources place the volume at approximately 328 million cubic miles. Ocean waters comprise about 85 percent of the total water on the earth's surface.

The volume of all land above sea level is only one-eighteenth of the volume of the ocean. If the solid earth were perfectly smooth (level) and round, the ocean would cover it to a depth of 12,000 feet. ("Questions About The Oceans," U. S. Naval Oceanographic Office.)

ARE ESTUARIES NECESSARY?

By J. L. McHugh*

Those of you who are sport fishermen or duck hunters have heard a great deal about estuaries lately. You have been told, over and over again I am sure, that these rich borders of the sea are being altered rapidly by man and that these changes are contrary to your interests. As our population and our technology grow, the characteristics of the water are being changed by domestic and industrial pollution. Widespread use of highly toxic pesticides has been blamed for large-scale fish kills in many parts of the country. Recent fish kills in the Mississippi River have been attributed to pesticides, and some people think that these toxins also have caused the alarming disappearance of pelicans from the Gulf coast. In some places there are fears that artificial radioactivity is a danger to fishery resources. Even the common household detergents are known to have adverse biological effects on marine life. The extreme effects of these various chemical changes, which produce massive kills that everyone can see, often stir up enough public opinion so that something is done about the causes.

Scientists, however, are much more concerned about the more subtle effects of pollution. We do not really know very much about the effects of pollutants, but small pieces of evidence from individual scientific experiments tell us that the foreign substances we add to the water can affect marine life in many ways without killing. Even waste heat is a serious pollutant under some conditions. In the long run these unobserved effects may be more disastrous than those which pile up masses of dead fish on a beach. Changes in water quality may affect spawning, growth, feeding, resistance to disease, and many other characteristics of animals. The causes of these effects are very difficult to identify because natural phenomena also create wide variations in these characteristics.

There is great concern also over the many physical alterations taking place in our estuaries. Channel dredging, filling of marshlands and shallow areas, dams and other water diversion projects, all create changes of one kind or another in the environment. Like the effects of pollution, some of these environmental alterations have obvious effects on marine life. It is not difficult to recognize the adverse effects of silt deposition on an oyster bed. The living oysters are smothered and die, and the bottom is made unsuitable for future generations of oysters. But engineering projects cause other, less dramatic, changes which alter current flows, change the salinity or temperature of the water, and create other conditions which may or may not be harmful to our fishery and wildlife resources.

We also must not forget the effects of these environmental changes on man himself. Animals have a remarkable capacity to concentrate within their bodies large quantities of pesticides and other chemicals. In the laboratory, for example, our scientists have demonstrated that oysters can accumulate concentrations of DDT many times greater than the concentration in the surrounding environment. This amazing power was illustrated dramatically by an experiment in which oysters held in running water containing one part of DDT per 100 million parts of water accumulated residues of 151 parts of DDT per million parts of water in 7 days! This far exceeds the permissible level in meat allowed by the Food and Drug Administration. Fortunately, we have never found such high residues in oysters in the natural environment, but the experiment shows that it could happen.

Engineering projects in coastal waters do not pose threats to man directly. In fact, they

*Dr. McHugh is Deputy Director, Bureau of Commercial Fisheries, U. S. Department of the Interior. He is presently on detail to Office of the Assistant Secretary for Fish and Wildlife, Parks, and Marine Resources as Acting Director, Office of Marine Resources.

Author's Note: "This talk was presented at Annual Meeting of Sportsmen's Clubs of Texas, Driskill Hotel, Austin, Jan. 16, 1965. The issues and problems described are just as important today, and some are more acute. It was necessary to make some changes in the text to bring figures up to date or to incorporate new knowledge."

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 827

are carried out for man's benefit. In many ways, however, they may lead indirectly to adverse conditions. For example, a deeper channel will increase the flow of shipping to a port. This will attract new industries, which will add to the load of industrial pollution. Industry in turn will attract more people into the area, adding to the flow of domestic pollution and hastening alteration of the shoreline for residential and recreational development. Growing industry and population will increase the demand for water, some of which will be lost entirely to the estuarine system. The remaining water will be altered in many ways before it is returned to the estuary.

What Is An Estuary?

We all talk knowingly about estuaries and their importance to man, but are we all agreed on what we mean by this term? The dictionary says that an estuary is an arm of the sea, or a river mouth, where fresh water from the land mixes with salt water from the sea. Nearly everyone agrees that an estuary has an arbitrary seaward boundary. Along the Texas coast this boundary lies across the passes which mark the entrances to Galveston Bay, Matagorda and San Antonio Bays, the Laguna Madre, and other protected coastal waters. On our Atlantic coast the seaward boundary of such well-defined estuaries as Chesapeake Bay, which is really a drowned river mouth, is a line joining the two headlands which mark the entrance from the sea, the historic Capes Charles and Henry.

Yet the notion of a geographically defined seaward boundary, to mark an area which owes its definition to mixing of river water with the sea, is quite illogical. You who live on the Gulf of Mexico know that the effect of the great Mississippi River is felt far beyond its mouth. The whole northern part of the Gulf is diluted with Mississippi water. As a child I remember reading and marvelling at stories of mariners approaching the Atlantic coast of South America who met the muddy waters of the mighty Amazon hundreds of miles at sea. The flow of these rivers varies seasonally to a remarkable degree. The legendary floods of the Mississippi carry more than 30 times the volume of water that flows into the Gulf during times of drought. Fluctuations in the Amazon drainage probably are even greater. It is inevitable that the seaward extent of mixing of land drainage with the sea fluctuates widely. This, in turn, must have profound effects on the fishery resources and on all marine life.

We know that the kinds of fish and their abundance in the enclosed coastal waters vary seasonally and from year to year. Some of these variations are caused by temperature changes, but changes in the salinity or salt content of the water are important, too. I prefer to define an estuary entirely on the basis of mixing of fresh and salt water and to consider that this is a dynamic, fluctuating environment, not tied to fixed geographic boundaries. This coincides much more nicely with the habits of the fish, their migrations, movements, and fluctuations in abundance.

What Are the Typical Animals of An Estuary?

A complete catalog of the life of an estuary would be far beyond the scope of this article. Most abundant are the microscopic plants and animals, including bacteria, which drift freely in the water or cover the surface of the mud, sand, or other materials which form the shores and bottom. The most typical estuarine animals from the popular point of view probably are drifting jellyfish, so common at some times of the year; the various mollusks such as oysters, clams, mussels, and snails; and crabs of various kinds, especially the toothsome blue crab of the Atlantic and Gulf coasts. Then there are the abundant shrimp, especially the large species which support our most important fishery; and numerous migratory fishes. To most of you, I suspect, the most important fishes of the inshore waters are the croakers and sea trouts, jacks, and perhaps mullet. To me they are the anchovies and menhaden, for these herring-like fishes, although not eaten by man or caught by him for sport, are our most abundant estuarine fishes.

An important characteristic of these estuarine animals--the oyster and its molluscan relatives and a few other species excepted--is that they do not remain within the boundaries commonly considered to be the limits of the estuary. Instead, they migrate periodically into the open sea, sometimes far from land. We do not know very much about these migrations, but offshore sampling has told us that large quantities of marine life useful to man are to be found over the Continental Shelf in the Gulf of Mexico. This is a fairly recent discovery, for it was only a few years ago that scientists were saying that the Gulf was almost a biological desert, unable ever to yield a large fishery harvest.

Why Are Estuaries Important?

Much of the commercial fish catch of the United States is made up of animals which spend important parts of their lives in estuaries. Of the 10 most valuable kinds of fish in our commercial lands, 7 are typically estuarine. These 7 kinds--shrimp, salmon, oysters, crabs, clams, menhaden, and flounders--account for about 58 percent of the total value of our commercial fishery landings. In the Gulf of Mexico, estuarine-dependent resources supply about 90 percent of the commercial catch. For the entire U. S. seacoast, the catch is about two-thirds estuarine-dependent. Large numbers of these and other kinds of estuarine fishes also are caught by sportsmen. In fact, sport fishermen land greater quantities of some kinds of marine fish than commercial fishermen do. Thus, estuaries are very important to us as producers of commercial and sport fishery resources.

The sheltered waters near shore, which we commonly recognize as estuaries, are equally as vulnerable to alteration by man as are our inland lakes and rivers. We are using our rivers to a greater and greater degree as sewers for waste disposal. We are transforming the channels and shorelines with almost frightening speed. We are developing plans for water diversion which promise to perform miracles for flood control and agriculture, but which will alter forever the characteristics of our coastal waters. These developments are certain to affect the ecological balance in the estuarine environment. It is only prudent in the absence of thorough knowledge to assume that many of these changes will be adverse.

There are many gaps in our understanding of the estuarine environment. It is human nature to emphasize what we know, or what we think we know. Because we concentrate our human population on coastal areas, and move out on to the shallow coastal seas for our recreation, we are impressed with the the wealth of life that we observe in these edges of the sea. There might be abundant life farther offshore in oceanic waters, but we venture out there less frequently and in smaller numbers. When we move offshore we do so in larger vessels, and in so doing we lose our intimate association with the sea surface and its bottom. Small wonder that we have become impressed with the bounty of our shallow waters. Our harvest from these waters is greater than from any other natural area of equal extent. There is no doubt that the inshore estuaries are of great importance. For example, we know that shrimp, menhaden, and other important fishery resources spawn offshore, but great numbers of young find their way into the shallow, protected, inshore waters soon after hatching. The offshore waters influenced by land drainage also are important and we need to improve our knowledge of those waters. They may be as important as the inshore estuaries, and the offshore estuary can be affected by man's activities, too.

Many people believe that the rich biological productivity of estuaries is caused principally by the constant renewal of nutrients brought down by the rivers from the land. The rivers do contribute minerals and other substances essential to life, it is true, but the total amounts brought into the estuary by this mechanism often are small compared with the quantities brought in from the sea. It is not commonly understood that the relatively light river water flowing down from the land tends to spread out over the surface of the denser, saltier water of the sea, almost as a layer of oil will stay at the surface of the water. Oceanographers know that the energy contained in this seaward-moving land runoff at the surface generates a return flow of sea water along the bottom. The volume of nutrients in the deeper sea water flowing toward the land, in most estuaries, is several-fold greater than the natural nutrient load of the rivers. Thus, the secret of estuarine productivity is the constant inflow of ocean water, "plowing" and fertilizing the entire coastal zone. If runoff from the land increases, this process of enrichment increases in proportion. If runoff ceases, enrichment ceases, too. River runoff is the cause of estuarine productivity, but usually for a different reason than most people believe.

Along the Texas coast are two extreme types of estuary, the kind I have just described, in which runoff generates an inshore flow of salt water, and a kind like the Laguna Madre, in which loss of water by evaporation exceeds the total contribution from the land. The first is called a positive, the second a negative, estuary. The third kind, the neutral estuary, is one in which land runoff and evaporation just balance. It is interesting that a negative estuary also is enriched steadily with nutrients. Excess evaporation tends to

lower the surface of the water, and ocean water moves in to restore the balance.

The counter flow of fresh and salt water can extend far beyond the limits of the conventional inshore estuary. The entire North Pacific Ocean, north of about 45° N. latitude, is an estuarine zone by this definition, and it has been shown that beneath the vast surface lens of relatively low salinity water the deeper oceanic water flows in toward the land. On our east coast, off Chespeake Bay, bottom-drifting markers released near the edge of the Continental Shelf have been recovered inside the Bay. This and other evidence show that the entire northwestern Atlantic north of Cape Hatteras and west of the Gulf Stream is an estuarine zone. A wide band of water along the northern coast of the Gulf of Mexico has similar characteristics. These are among the richest fishing grounds of the world.

What Is Man Doing to the Estuaries?

Fly over the coastal areas of the United States and marvel at the intricate patterns that nature creates. Over much of the Atlantic and Gulf coasts one still can be impressed by the vast salt marshes with their serpentine, branching drainage patterns, and the extensive bodies of quiet shallow water protected by offshore bars, peninsulas, and islands. But wherever one flies over this fascinating shoreline, one cannot fail to see scars created by man. In some areas miles upon miles of coast have been scalloped by residential developments in which every site is a waterfront lot. Marshes are criss-crossed by drainage and navigation channels. Waters are roiled by the furious activity of dredges, maintaining the controlling depth of navigation channels or making them deeper. Unsightly banks of mud and sand pile up in shallow water or on marshland as these dredges bite into the bottom and spew out their load. Great industrial plants throw smoke and flame into the atmosphere, almost blotting out the view in some areas. For miles downstream from these belching factories, the water is foul and discolored. Thousands of small boats churn the muddy bottom, or lie at their moorings, each a potential despoiler of the waters. Outboard motors, discharging their exhausts underwater, pour lead and combustion products into the environment. One thinks of the abundant marine life in these crowded waters and cannot conceive that these resources benefit from all this human activity.

Yet some of these same effects are produced by natural events. Strong winds scour the bottom, muddy the waters, and pile silt and sand in places new. Heavy rains or melting snow change runoff patterns, altering sharply the natural chemical characteristics of the water, and carrying tremendous loads of oxygen-demanding organic material down from the forests, the farmlands, and the marshes. Sudden weather changes cause sharp rises or drops in air temperature, which in these constantly moving, shallow waters quickly alter the temperature of the water. This is a harsh environment for animals, and it is certain that large numbers have been killed by such natural catastrophes from time to time, long before man appeared on the scene.

Thus, it is difficult often to identify the causes of fish kills, or of natural variations in abundance or migration patterns, because these effects can be produced by nature or by man. The principal difference is that nature's effects are not permanent, and the resources eventually recover from natural catastrophes. In fact, the animals have evolved for survival in this constantly changing environment, and many are favored by the natural changes they experience. Man-made changes, on the other hand, usually are permanent. We must be firm in opposing those environmental changes which we know are harmful to marine life. We must be equally as reluctant to accept changes which have less clear-cut effects, until we learn more about the influence of these changes on estuarine life. But we had better be quick to get the information we need, or we will not be able to stem the flow of "progress" very long.

Above all, we must be cautious about diverting the fresh waters that enter our estuaries. It is this flow which provides the energy to plow and fertilize estuarine waters and which creates the rich fishery resources with which our coastline is blessed. If this flow is stopped, or even substantially reduced, the fisheries will suffer accordingly. It is that simple.

Is Commercial Fishing Detrimental to Sport Fishing?

I cannot conclude without referring to the controversies that divide our fishermen and weaken their power to combat mutual problems. It is discouraging to see these conflicts between you, absorbing much of your

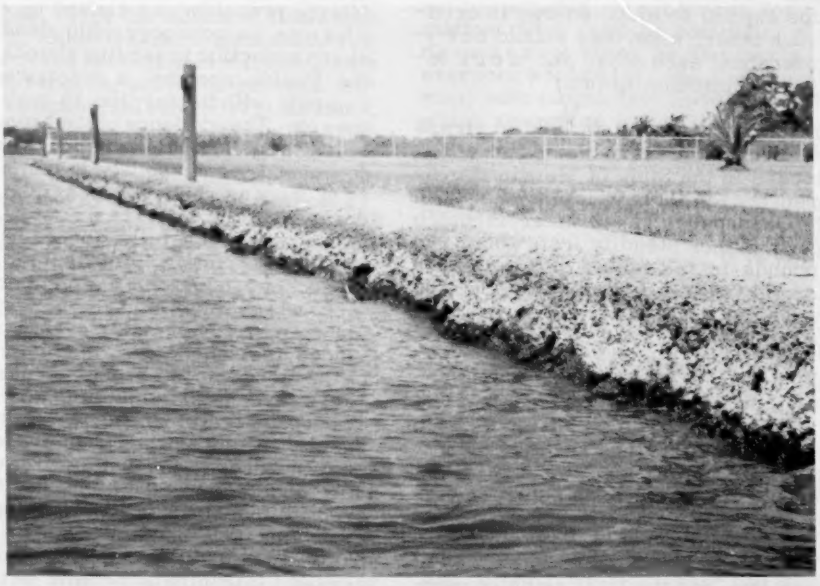
Fig. 1 - Transformation of an estuary to increase the number of waterfront homesites. Such developments are typical of many estuarine areas in the United States. Marshland important to fish and wildlife is destroyed and the biological productivity of the area usually is seriously reduced.

BEFORE

AFTER

Fig. 2 - Destruction of valuable estuarine marsh by spoil from hydraulic dredging for real estate development. The mound in the right background is the discharge end of the dredge line. The widespread effect upon the marsh and water areas is readily evident.

NATURAL VEGETATED SHORELINE



BULKHEADED SHORELINE

Fig. 3 - A valuable nursery area for small shrimp destroyed by bulkheading. This is a typical example of man's increasing encroachment on our estuarine areas.

energy. After all, sportsmen and commercial fishermen have the same eventual objectives, which are to maintain the fishery resources in a condition that will produce the maximum possible yield. Dr. Gordon Gunter, the well-known Director of the Gulf Coast Research Laboratory at Ocean Springs, Mississippi, recently published an article[1] in which he exploded the principal myths which people use over and over again to "prove" that menhaden fishing is harmful to sport fishing. Although he dealt effectively with the alleged adverse affects of the commercial fishing, he failed to suggest some benefits that may accrue from menhaden fishing, by reducing their predation on eggs and tiny young of fish and shellfish valuable for sport. The menhaden is an omnivorous feeder, with a highly efficient straining apparatus that engulfs virtually everything in its path. Commercial fishing can reduce this predation, probably to the benefit of sportsmen. Some commercial fishermen, it is true, act unwisely by interfering with the pleasure of recreational boating and sport fishing. They give a wholly undeserved bad name to commercial fishermen as a group. There are hotheads among sportsmen, too, who are quick to condemn something they do not fully understand. To me, it is tragic that these two groups expend so much energy in criticism of each other, when they should be trying to understand each other and work together against common threats.

One or two examples might help to stress this point. Back in the early 1930's there was great concern in the State of Maryland over the apparent decline in production of striped bass. The Chesapeake Bay commercial catch had dropped rather steadily from about two million pounds in the 1880's to about half a million in 1934, and there was strong feeling that commercial fishermen were destroying the resource. At that time, it was believed strongly that large nets like purse seines, used to catch densely schooling fish like menhaden, were "destroying" large numbers of striped bass and other food and sport fish. Consequently, the Maryland Legislature enacted a complete ban on purse seines in Maryland waters. This law has been enforced rigidly ever since. Virginia, however, did not follow suit. Consequently, the menhaden fishery prospered in the Virginia portion of Chesapeake Bay, and the total catch of menhaden by the "destructive" purse seines probably has been little, if any, less than it would have been had Maryland not prohibited this gear. The result has been that the State of Virginia has collected the revenue, and her citizens have reaped the profits, that have accrued from this thriving fishery, while Maryland has gained nothing. And what has been the effect of this "destruction" on the striped bass resource? Catches have risen steadily. In the past 5 years, the average annual commercial catch has been about 9 million pounds, at least 18 times as great as it was 30 years ago! The sport catch probably has increased as much or more than this.

On the Pacific coast the once-great sardine fishery has gone. From a peak of almost 800,000 tons in 1936, the catch has dropped to insignificance. Despite very strict regulation of the fishery in recent years, there has been no evidence of recovery. Intensive scientific studies of the California Current system since 1950 have uncovered some interesting facts, however, which help to explain this decline and failure to recover. The abrupt collapse of the sardine fishery in 1946, following a ten-year period of good catches, was almost certainly caused by a combination of intense fishing and a sharp reduction in success of sardine spawning. The spawning failure probably was caused by a temporary change in oceanographic conditions. The sharp reduction in sardine abundance allowed the Pacific anchovy, a species well fitted to compete with the sardine, to multiply and fill the gap. The evidence pieced together by the scientists shows clearly that the anchovy has increased tremendously in numbers. It now is at least as abundant, possibly more abundant, than the sardine ever was. What is needed is a carefully controlled scientific fishing experiment to measure the effects of an anchovy fishery on the numbers of anchovies and sardines. But the powerful California sport fishermen's organizations, convinced that anchovies are an essential food of the most important sport fishes, were for years successful in blocking such proposals. The commercial anchovy fishery is so severely regulated that it is producing only a very small fraction of the catch that it probably could sustain. The result is that hundreds of thousands of tons of Pacific anchovy are living their normal life span and dying a natural death, wasted so far as man is concerned. Uncontrolled commercial fishing should not be allowed, but we need to know the

1/"The Gulf of Mexico menhaden fishery in relation to the sports fisheries." Proceedings of the Gulf and Caribbean Fisheries Institute, 16th Annual Session, Nov. 1963, pp. 99-108.

annual surplus production of anchovies that can be taken safely by commercial fishermen without damaging the resource or interfering with sport fishing.

What Can We Do?

By now I am sure it is clear to you that the question posed in my title has only one answer: "Yes, estuaries are necessary to maintain the rich harvest of the edges of the sea around our coasts." I am sure it is also clear that we do not know all we need to know about this important environment and its living resources. Moreover, I hope you have recognized that many of the things we think we know do not fit the facts. For example, from the point of view of the fisheries, we should recognize the estuaries often extend their influence many miles seaward. The most important thought I can leave with you is to urge that you recognize the need to improve our understanding and to give weight to demonstrated facts instead of opinions in planning for better fishing.

The Federal Government, the States, and private organizations have spent a great deal of money in scientific research on the ocean and its living resources. The knowledge that has accumulated is scattered in a great variety of scientific journals, official reports, personal files, or in the minds of those who did the work. Other valuable information on fishery resources is contained in fishermen's logs, license records, and in the personal experience of commercial and sport fishermen. Never has this vast store of information been gathered together and analyzed thoroughly. On the rare occasions when limited attempts have been made to synthesize existing knowledge, a surprising wealth of useful knowledge was revealed. It seems to be a common failing to ignore this treasure trove of existing knowledge in the rush to deal with urgent problems of the moment. We should encourage competent specialists to accumulate, analyze, and interpret what has already been gathered.

Such summaries have two distinct benefits. They demonstrate, usually to the surprise of everyone, that we know much more than we had realized. Secondly, they sharpen our planning by pointing out the gaps that need to be filled. By proceeding in this systematic fashion, it is possible to put available knowledge to work immediately and to fill in the missing pieces as quickly as possible. These simple principles are the essence of any successful business enterprise. It is quite astounding that we so seldom have applied the same principles to our resource utilization problems.

We must recognize that change is an inherent characteristic of natural events. Thus, the abundance and behavior of marine life are certain to fluctuate from natural causes, and it will be a long time before we learn how to control these natural variations, if indeed we ever can. We will always be tempted to blame these natural fluctuations on the disturbing forces created by man. Indeed, there will be many occasions when it will not be possible to say whether nature or man was the culprit. When our lack of knowledge forces such a conclusion it is impossible to deal effectively with human causes. We will always be able to cope most efficiently with man-made causes if we keep open minds and recognize that natural forces sometimes, although by no means always, are far more powerful and widespread than our own. And finally, we must always remember that well established facts and judgment are the best tools for solving problems.

In the long run we will protect our natural resources best and will gain the greatest use and enjoyment from them if we bring all the facts and all the interests together. We cannot wait for complete information before we act to conserve our resources, for our information never will be complete, nor will the necessary steps be as clearly defined as everyone would wish. But the wisest actions, even with incomplete knowledge, are those which attempt to marshal all available facts objectively. We should avoid the traps that we so very often set for ourselves by attacking only one small part of the problem, creating much more heat than light. By hasty action we often dissipate our energies on details and so have no power left when it is needed most.

Are Estuaries Necessary?

Yes, estuaries are necessary if we are to preserve the natural productivity of our coastal waters. But we had better be sure we know what an estuary is. Water flow is the answer, and reduced runoff could be the most crippling blow. We could, of course, provide artificial sources of energy as a substitute, but the cost would be prohibitive. Maintaining the water supply is not the only requirement, however. The quality of that water must be guarded just as jealously as we guard the supply. Finally, we must make full use of existing knowledge, and interpret it intelligently. With the present status of our knowledge thoroughly understood, we can proceed to fill the gaps with facts instead of opinions.

●○●○●○●

THE FISH-FINDING SONAR OF "OREGON II"

By Donald A. Wickham* and Shelby B. Drummond*

Horizontal scanning sonar for fish finding has developed considerably in the past decade. It has become indispensable to the purse-seine fishermen of northern Europe, whereas aerial spotting is used by American purse-seine fishermen for locating fish schools. This difference may be due, in part, to unfavorable experiences with early models of sonar; these were usable only in deep water, were expensive, and required extensive training in sonar operation and interpretation. New interest in the use of sonar was aroused in the Gulf of Mexico purse-seine fishery by sonar demonstrations aboard the BCF exploratory fishing vessel Oregon II during the last quarter of 1967.

Personnel of the BCF Exploratory Fishing and Gear Research Base at Pacagoula, Miss., were exposed to the newly installed, high powered, horizontal-scanning sonar aboard the Oregon II (recently delivered by the builder). Portions of the shakedown cruise were devoted to familiarizing personnel with the operations and capabilities of the sonar. This activity is one of the main purposes of the Base's Sonar Technology Program.

This paper outlines some methods used during our preliminary trials and the limitations we discerned in using sonar.

DESCRIPTION OF SONAR EQUIPMENT

The sonar aboard the Oregon II operates at a frequency of 20 kHz (kilohertz = 1,000 cycles per second). Two acoustic power modes, 4.5 kw. (kilowatt) and 0.5 kw., can be selected manually for matching with pulse durations of 1, 3, or 10 milliseconds. This sonar can be operated at four range scales: Range I (0-275 fathoms), Range II (0-550 fathoms), Range III (0-1,100 fathoms), and IV (0-2,200 fathoms). The sonar beam configuration, measured at the -3 decibel level, is slightly eliptical in cross section, being 13° horizontally and 15° vertically. A shallow-water suppressor circuit was installed in the unit to reduce bottom echo interference. This change permits effective school location in water as shallow as 4 fathoms (safe inner limit of operation for Oregon II).

METHODS

As the personnel of the Sonar Technology Program gained proficiency in the use of Oregon II's off-the-shelf sonar, attempts were made to evaluate its suitability for delineating horizontal dimensions of fish schools. The effective use of sonar to estimate fish school dimensions requires accurate determination of the distance between the school and the sonar transducer (range), complete penetration of the acoustical signal through the school (horizontal school width), and accurate determination of the degrees of arc (scan degrees) occupied by the school.

The number of degrees of scan through which a school could be detected was determined from the transducer bearing indicator, the equivalent of the center of the sonar beam. If we assume that acoustic power sufficient to generate echoes from a fish school would be within the known beam angle of 13°, a correction factor of one beam width of 13° could be subtracted from the scan angle determinations to establish more accurately the degrees of arc occupied by the school. This is the reason for the correction: When the sonar beam is scanned across a fish school, an echo is picked up when the leading edge of the beam first contacts the target, about 6.5° ahead of the center of the beam in this example (fig. 1). Similarly, as the beam is scanned past the target, the trailing edge of the beam should record the target for about 6.5° behind the center of the beam.

Sonar scans of fish schools were made in conjunction with the Base's Aerial Fishery Survey Program. Measurements taken from aerial photographs of scanned fish schools were used to compare sonar measurements. In this evaluation, the greatest school

*Fishery Biologists, Exploratory Fishing and Gear Research Base, Pascagoula, Miss. 39567.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 828

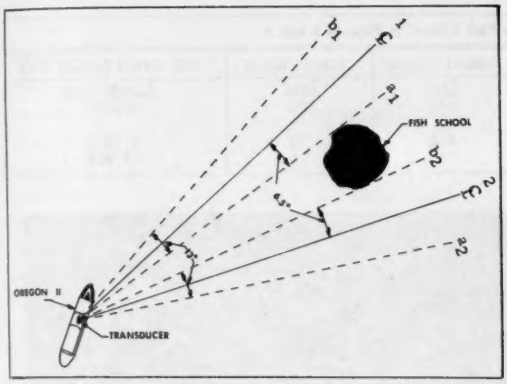


Fig. 1 - Schematic illustration of sonar beam pattern initiating fish school echoes during scans: (1) center of sonar beam approaching fish school, (2) center of sonar beam passing beyond fish school, (C) center line of sonar beam as indicated by transducer bearing indicator, (a_1) leading edge of sonar beam with sufficient acoustic power to generate a detectable fish-school echo trace, (b_2) trailing edge of sonar beam with sufficient acoustic power to generate a detectable fish-school echo trace.

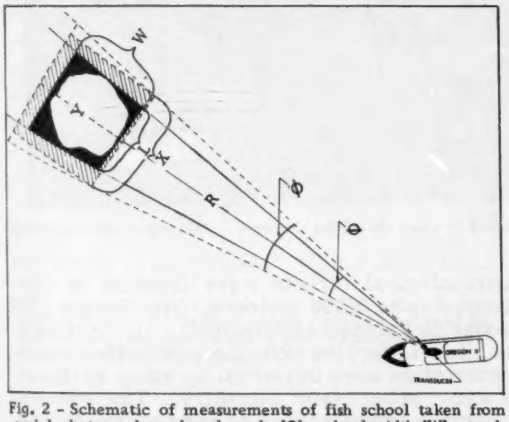


Fig. 2 - Schematic of measurements of fish school taken from aerial photograph; school angle (Θ), school width (W), and school length (L), superimposed over measurement of the same fish school determined from sonar data; scan angle (Φ), sonar trace length (Y), calculated school length (X), and school range from the vessel (R).

dimensions from the photographs were used because these dimensions more closely approached the type of data obtained from the sonar. Figure 2 shows the method used to obtain fish school dimensions from photographs and to reconstruct school dimensions from sonar data.

The sonar tape provided an estimate of school range and school width along the sonar beam axis. The degrees of arc occupied by the fish school (scan degrees) were read directly from the sonar transducer bearing indicator and were recorded during each scan of a fish school. Using this sonar data we could estimate greatest horizontal length, perpendicular to the sonar beam for the school by the formula $L = R \tan \phi$ where:

L = school length (feet)
ϕ = scan angle (degrees)
R = range or distance (feet) from the sonar transducer to the near side of the fish school

RESULTS

The range and estimated horizontal school widths from the sonar traces appeared to be within the limits of measurement error when compared with the school dimensions from the aerial photographs. Apparently the 4.5-kw. sonar acoustic signal was powerful enough to be reflected from fish on the near side of the school as well as to penetrate through the school to the far side, providing a sonar trace indicative of the school width. Reverberation on the far side of the school apparently did not significantly extend the sonar trace, as frequently occurs during vertical echo sounding.

Comparisons of sonar and aerial photograph measurements revealed considerable differences in values for scan angles and, consequently, calculated school length. The maximum surface area of a school determined from the photograph was compared with the surface area calculated from the sonar data. The discrepancy in surface area estimates by the two methods is shown in figure 2 and in table.

The photographic and sonar measurements in table were taken from the aerial photograph (fig. 3) and sonar trace number 1 in figure 4. This example contains data from one of our better sonar-aerial photograph comparisons. Most of our preliminary evaluations of fish-school dimensions did not agree as closely as the example; however, we wish to emphasize that the sonar aboard the Oregon II was not designed to obtain scientific acoustic measurements. Insufficient knowledge of acoustic signal transmission and the variable accuracy of sonar data among operators appeared to be the major sources of discrepancy between sonar and photographic data for the determination of fish school dimensions. An estimate of operator error could have been determined if sufficient scan-photo combinations had been available for statistical treatment. Any

Comparative Measurements from the Fish School in Figures 3 and 4					
Method	School Range	Scan Angle	School Length	School Width	Calculated Surface Area
	Feet	Degrees	Feet	Feet	Square Feet
Photograph	1,343	7	141	101	14,241
Sonar:					
Without angle correction . . .	1,345	21	516	93	47,988
With 13° angle correction .	1,345	8	189	93	17,577

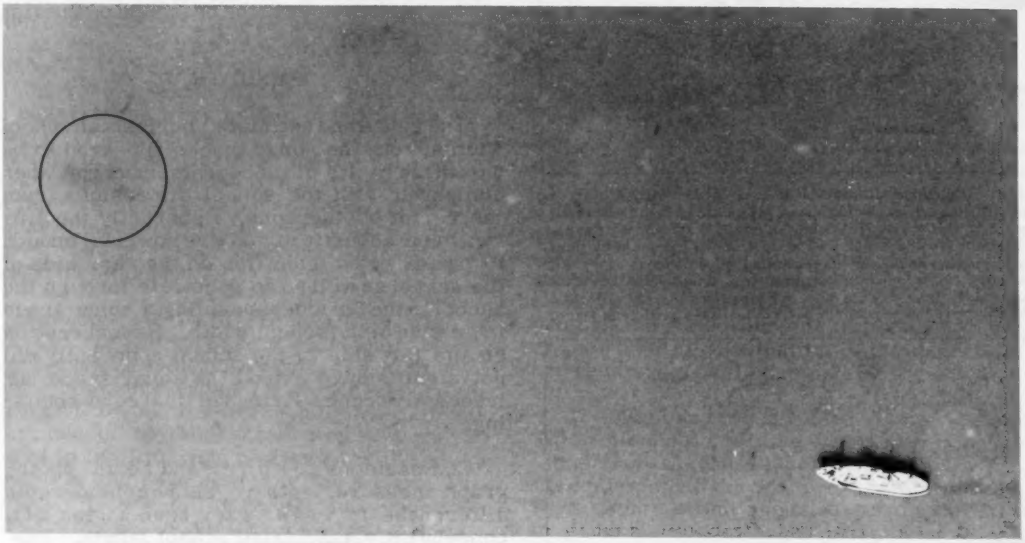


Fig. 3 - Aerial photograph of fish school (marked by circle) being scanned by sonar aboard the Oregon II. This school was believed to be composed of thread herring, Opisthonema oglinum.

further elimination of error would require calibrating the sonar equipment and evaluating the echo characteristics of fish schools.

The difficulty in obtaining fish school dimensions and calculating their surface areas was further compounded by the constant amoebalike changes in the fish school configurations. Figure 5 shows examples of variability in fish-school surface patterns.

Fish-finding sonars are designed primarily to locate fish schools or other targets at a distance from the vessel, and then are used to direct the vessel for effective capture of the target. The sonar aboard the Oregon II was capable of detecting fish schools at a range of at least 800 fathoms, and then was used to direct the vessel over the school for target confirmation by vertical echo sounder. Under favorable conditions, nonbiological targets were detected at distances up to 2,000 fathoms. The Oregon II's sonar functioned satisfactorily in relatively shallow water; the echo discrimination characteristics were improved by using shallow-water suppressor circuitry. The sonar's effective range was restricted slightly in less than 10 fathoms and in rough seas.

The value of sonar for supplementing aerial reconnaissance was clearly demonstrated during the initial cruise. Thread herring schools were abundant off the west coast of Florida while the sonar was being tested. Following BCF advice, several commercial purse seine vessels with aerial fish spotters had moved into the area. On several occasions, when water turbidity and lighting conditions were unfavorable for reliable aerial detection, the sonar aboard the Oregon II was used to direct the purse seiners to fish schools.

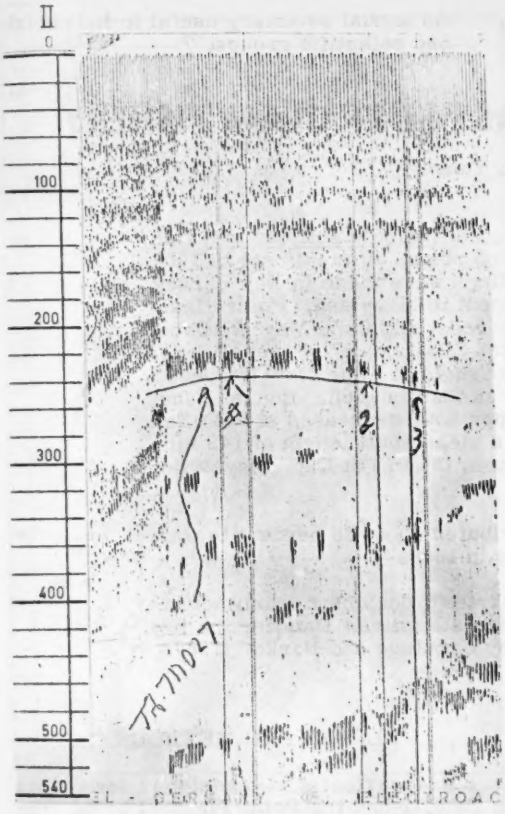


Fig. 4 - Sonar paper tape of fish school circled in fig. 3. The scale is calibrated in fathoms, and the effective range of the sonar extends beyond the scale in this illustration. Measurements of this fish school are given in table.

The vessel returned to the area of fishing off west Florida during December when the fishing industry asked for sonar assistance. As a consequence of this sonar demonstration, some industrial fish companies have considered equipping vessels with sonar.

This preliminary sonar experience has provided a nucleus of trained sonar operators who familiarized other Base personnel with applications of fishery sonar. For the reader interested in the principles of sonar operation and fishing tactics, this information is presented in two books by D. G. Tucker, "Underwater Observations Using Sonar" and "Sonar in Fisheries," both published by Fishing News (Books) Ltd., London.

Fig. 5 - Aerial photograph of fish schools (thread herring) showing variability in their surface configurations. A dye marker dropped by the photo airplane can be seen near the Oregon II.

Our early field work has revealed problems associated with acoustical measuring techniques and has provided sufficient background experience to develop program aims and equipment requirements for future efforts of acoustic fish-school evaluation.

An annual summary useful to industrial and scientific groups.

THE 1967 ATLANTIC COAST SURF CLAM FISHERY

By Robert M. Yancey*

The 1967 landings of the surf clam (Spisula solidissima) fishery equaled the record of 45 million pounds of meats set in 1966. About 92 percent of the total landings were made in New Jersey, 5 percent in New York, and 3 percent in Maryland. Point Pleasant landings contributed about 55 percent and Cape May-Wildwood 44 percent to the New Jersey total. Daily catches averaged 220 bushels at Point Pleasant and 233 bushels at Cape May-Wildwood. This catch is about 30 percent less than in 1966. Hours fished per day increased and catch per hour decreased at both New Jersey ports. Clams landed had a mean shell length of 149 mm. (6 in.) at Point Pleasant and 141 mm. ($5\frac{1}{2}$ in.) at Cape May-Wildwood.

The surf clam fishery contributed about 35 percent to total U. S. molluscan shellfish landings in 1967.

This report is the third of a series to document yearly activities of the fishery and to summarize statistics. Data for the two previous years were reported by Groutage and Barker (1967a, 1967b).

FISHING AREAS

The New Jersey fishery has two centers--one off Point Pleasant and the other off Cape May (fig. 1). In the past few years, 76-80 percent of the New Jersey catch came from the Point Pleasant fishing grounds and 20-24 percent from off Cape May. New Jersey production was more evenly divided between the two areas in 1967, when the landings were about 55 percent at Point Pleasant and 44 percent at Cape May-Wildwood. As catch per hour dropped slightly at Point Pleasant, more boats moved to Cape May-Wildwood where the catch per hour was better (fig. 2).

Also, the Cape May-Wildwood fishing area changed in size and location in 1967 as the result of more exploratory trips by the enlarged fleet.

Surf clams landed in New York were taken off the southern coast of Long Island, and those in Maryland from off Ocean City.

FLEETS AND METHODS

A dredge fleet of 34 vessels, 11 fewer than in 1966, fished the Point Pleasant area. The fishing ground was between Barnegat Lightship and Point Pleasant. Clam beds in this area were 15 to 33 meters (50 to 108 feet) deep; average depth fished was 22 meters (73 feet). Most vessels made 1-day trips during daylight, as did surf clam vessels in all areas, but some fished overnight. Hours fished per trip varied from 1 to 15. Monthly averages of hours fished per day per boat are shown in figure 3. The average for the year was 8.8 hours. This time was 1.5 hours less than the yearly average in 1966. Dredge hauls continued at 4 per hour.

The Cape May-Wildwood fleet consisted of 26 vessels, an increase of 16 since 1966. Part of the increase resulted from a shift of boats from Point Pleasant; 5 vessels were new to the fishery. The depths of clam beds in the Cape May fishing area ranged from

*Fishery Biologist, BCF Biological Laboratory, Oxford, Maryland 21654.

U.S. DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Sep. No. 829

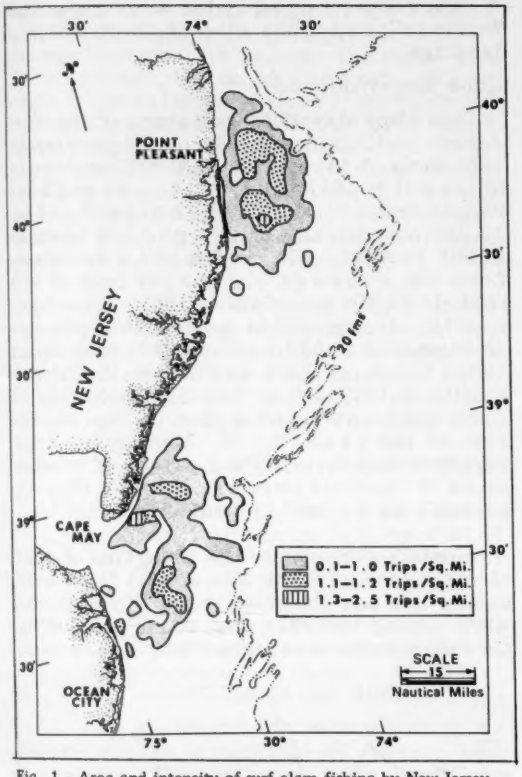


Fig. 1 - Area and intensity of surf clam fishing by New Jersey fleet, 1967 (based on 744 interviews).

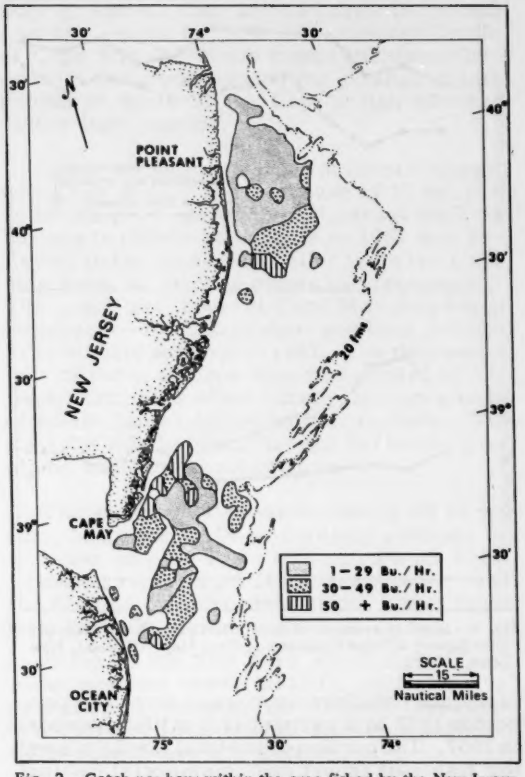


Fig. 2 - Catch per hour within the area fished by the New Jersey surf clam fleet in 1967 (based on 744 interviews).

5.5 to 24.4 meters (18 to 80 feet). Average depth was 12 meters (39.5 feet). A few boats occasionally fished at night, but most fished during daylight. Hours fished per trip varied from 1 to 20 and the average fishing time per trip was 7 hours, an increase of 1 hour from 1966. Monthly averages of hours fished per day per boat are shown in figure 3. Three dredge hauls per hour were made in 1967, and 4 per hour in 1966.

The New York fleet consisted of at least 5 boats. One of these entered the fishery in spring 1967.

Two vessels fished all year out of Ocean City, Maryland, and other vessels fished there at irregular intervals. In 1966, only one boat fished the area, and only part of the year.

LANDING STATISTICS

Information on fishing areas and effort was obtained from interviews with vessel captains. Data on the amounts of surf clams landed along the Atlantic coast were taken from Current Fishery Statistics--or from data provided by personal communication from Fishery Reporting Specialists, BCF, Office of Statistical Services, in the respective states.

Total landings of 45 million pounds of meats equaled the record set in 1966 (Groutage and Barker, 1967b). The percentage contributed to the total by New Jersey was less in 1967--92 percent, 41.6 million pounds--than the 96 percent (43.2 million pounds) in 1966. New York landings rose from 4 percent in 1966 to 5 percent (2.3 million pounds) in 1967;

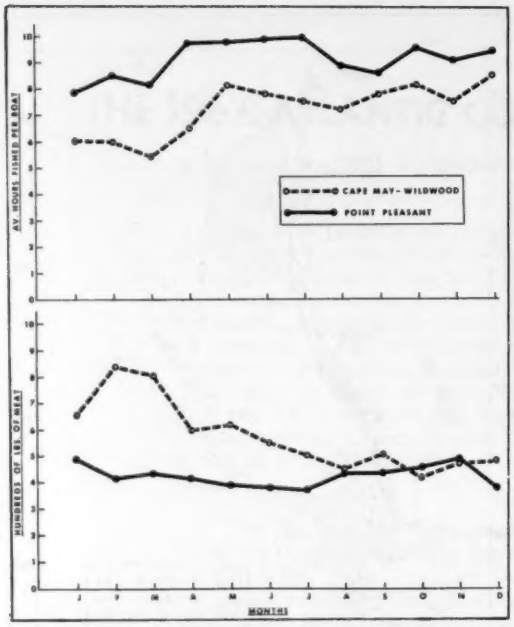


Fig. 3 - Monthly averages of daily effort (upper) and catch per hour (lower) at Point Pleasant and Cape May-Wildwood, New Jersey, 1967.

Maryland landings increased from 0.2 percent in 1966 to 3 percent (1.2 million pounds) in 1967. The portion of the total landings used for fish bait (sport and commercial fishing) continued to be small. About 1.8 percent (700,000 pounds) of the New Jersey landings were used as bait.

Landings in Rhode Island and Massachusetts remained insignificant and were used entirely for fish bait.

The shift in effort from Point Pleasant to Cape May was reflected in the proportion each area contributed to the New Jersey landings. Point Pleasant contributed 76 percent in 1966 but only 55 percent (22.9 million pounds) in 1967. Daily landings per boat ranged from 75 to 535 bushels (1,275 to 9,095 pounds of meats) and averaged 220 bushels (3,740 pounds). The average in 1966 was 332 bushels (5,644 pounds). The catch per hour (fig. 3) in 1967 averaged 25 bushels (425 pounds of meats); it was 35 bushels (593 pounds of meats) in 1966. Catch per hour remained generally steady during the year. Monthly landings fluctuated widely from 2.5 million to 1 million pounds of meats (fig. 4). Weather was probably the most important factor influencing the size of the monthly landings.

Cape May-Wildwood

The Cape May-Wildwood share of the New Jersey landings increased from 22 percent in 1966 to about 44 percent (18.4 million pounds of meats) in 1967. Daily catches per boat ranged from 98 to 1,120 bushels (1,666 to 19,040 pounds) and averaged 233 bushels (3,961 pounds). This catch was a decrease from the average per day per boat of 315 bushels (5,355 pounds) in 1966. Catch per hour (fig. 3) averaged 34 bushels (578 pounds) as compared to 53 bushels (893 pounds) in 1966. Catch per hour was high in the first 2 months of 1967, but it declined sharply in April and continued a slow decline for the rest of the year (fig. 3). Monthly landings ranged from 1 to 1.9 million pounds of meats. Sizes of landings were irregular (fig. 4), probably as a result of weather.

Monthly averages of the lengths of surf clams landed at Point Pleasant fluctuated somewhat, and the general trend was downward during the year (fig. 4). The monthly average lengths were more uniform, however,

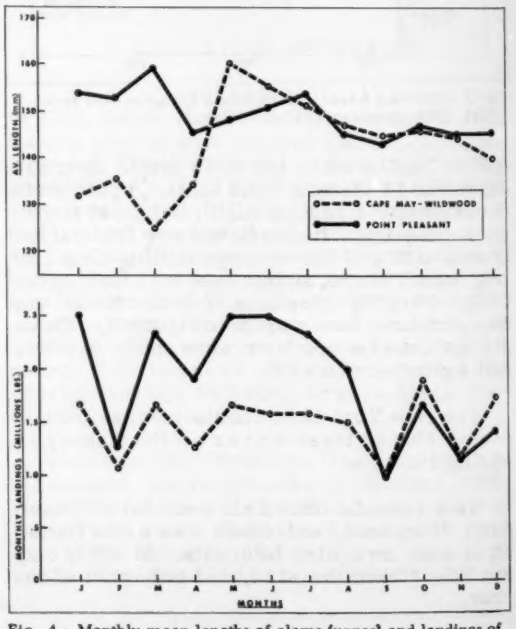


Fig. 4 - Monthly mean lengths of clams (upper) and landings of surf clam meats (lower) in New Jersey, 1967.

than those of clams landed at Cape May-Wildwood. The mean length of 4,440 clams sampled throughout the year at Point Pleasant was 149 mm. (6 inches); the range was 110 to 185 mm. ($4\frac{1}{3}$ to $7\frac{1}{4}$ inches). Mean length of clams landed at Cape May-Wildwood was based on measurements of 3,760 clams taken at random throughout the year. Mean length was 141 mm. ($5\frac{1}{2}$ inches); the range was 95 to 178 mm. ($3\frac{3}{4}$ to 7 inches). Monthly average lengths at Cape May-Wildwood increased sharply in May, and then decreased slowly for the rest of the year (fig. 4).

About twice as many clams less than 130 mm. (5 inches) long were discarded at sea than in 1966. About 3 bushels were discarded at sea for every 100 bushels landed at Point Pleasant, and about 6 bushels for every 100 bushels landed at Cape May-Wildwood.

STATUS AND TRENDS OF THE FISHERY

Fishing effort tended to shift southward in 1967. Some clam vessels left the Point Pleasant fishing area to dredge clams off Cape May. Five new boats joined the Cape May (N. J.) fishery, but only one was added to the Long Island, New York, fleet. Two boats fished full time and several others at irregular intervals out of Ocean City, Maryland, where only one fished part-time in 1966.

The average length of Point Pleasant clams was 149 mm. (6 inches) in 1967--2 mm. less than in 1966. The 1967 average length of Cape May clams was 141 mm. ($5\frac{1}{2}$ inches), appreciably greater than the 130 mm. (5 inches) average length in 1966. The average length of Cape May-Wildwood clams increased because a decline in demand for smaller clams prompted more of the fleet to fish offshore rather than inshore.

Catch per hour decreased at Point Pleasant and Cape May. The decrease of 10 bu. per hour (29 percent) at Point Pleasant from 35 bushels in 1966 to 25 bushels in 1967 was reflected in the increased reliance on the Cape May area to provide clams for processing. The catch per hour at Cape May decreased 36 percent--from 53 bushels per hour in 1966 to 34 bushels per hour in 1967. The decreased rate of catch at Cape May was caused by the fleet shifting its efforts from the dense beds of small clams inshore to offshore beds. The fleet did this to obtain larger but scarcer clams needed by processors.

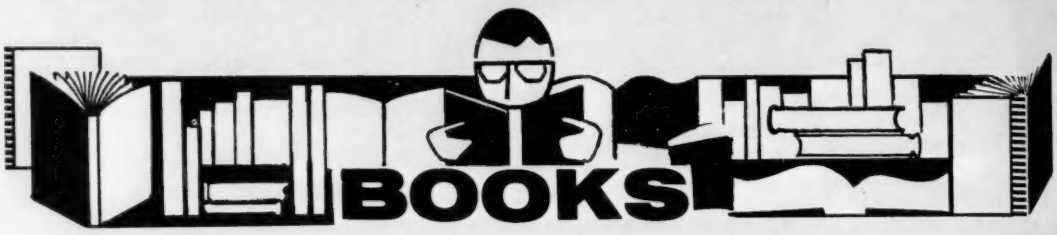
The number of vessels fishing off Ocean City, Maryland, will probably continue to increase in 1968 if the catch rate off Point Pleasant remains at its present level--and the demand for surf clam meats either holds firm or increases.

Although the New York surf clam fleet added one new vessel in 1967, the fishery is operating on rather limited beds off the southern shore of Long Island. Landings probably will not increase appreciably.

REFERENCES

GROUTAGE, THOMAS M. and ALLAN M. BARKER
1967a. The surf clam fishery. U. S. Fish and Wildlife Service, Coml. Fish. Rev., vol. 29, no. 2, pp. 55-58. (Also Sep. No. 780.)

1967b. The Atlantic surf clam fishery in 1966. U. S. Fish and Wildlife Service, Coml. Fish. Rev., vol. 29, nos. 8-9, pp. 64-67. (Also Sep. No. 797.)



BAHAMAN FISHES

"Fishes of the Bahamas and Adjacent Tropical Waters," by James E. Böhlke and Charles C. G. Chaplin, Livingstone Publishing Co., Wynnewood, Pa., 1968, 800 pp., 36 pls., 223 text figs., numerous unnumbered figs. This book is a tasteful and well-illustrated treatment of the shallow water (mostly above 100 ft.) fish fauna of the Bahamas. Although its primary aim is to facilitate the identification of Bahaman fishes, it is an invaluable source of information on many kinds of shallow water fishes from the entire tropical western Atlantic. The book, based chiefly on recent authoritative research, covers over 500 species. It includes discussions of each family, keys to genera and species, and a page of illustration and comment for each; some are illustrated in color. The references are a valuable guide to the species covered and to extra-limital forms as well.

--Daniel M. Cohen

BIOLOGICAL COLLECTING

"The Sea Brings Forth," by Jack Rudloe, Alfred A. Knopf, New York, 1968, 261 pp., illus., $6.95. Where does a Washington, D. C., zoologist studying barnacles get his specimens, or an Ohio medical school staff engaged in cancer research find anomalous fishes with tumors? How does a Chicago biochemist procure sharks' livers for his study of trigger mechanisms of nitrogen metabolism? Scientific researchers often rely on a man like Jack Rudloe, a professional biological collector. Still only 23 years old, he has written a most entertaining account of his collecting experiences and his friends among the shrimpers and crabbers--whose nets he gleans for 'trash' creatures useful to him, but worthless to them. This is the story of a young man in business, a record of adventurous entrepreneurship and at the same time, a most extraordinary nature book.

CARIBBEAN FISHES

"Caribbean Reef Fishes," by John E. Randall, T. F. H. Publications, Jersey City, 1968, illus., $12.50. This is a very useful guide to fishes of the Caribbean. These are the species most likely to be observed by man in the sea, or caught by man near shore. The book contains formal accounts of 300 species, all illustrated with photographs; half are in color. Dr. Randall has directed a marine biology survey on the Virgin Islands and is a former Director of the University of Puerto Rico's Institute of Marine Biology.

BEACHES

"Beaches--their lives, legends, and lore," by Robert and Seon Manley, Chilton Book Co., Philadelphia, Pa., 1968, 383 pp., illus., $9.50. The magic spell cast by a beach and the seashore's universal appeal have a particular significance for science and conservation today. The Manleys have painted a comprehensive picture of the geology, history, adventure, and conservation of the beaches of Hawaii, Puerto Rico, Mexico, the Pacific coast, the Atlantic seaboard, and the Gulf coast. The book is not only an unusual introduction to the coastal history of the U. S., it is also a vivid plea to conserve our beaches for the generations to come.

FRESH-WATER FISH

"A Systematic Study of the Greenside Darter, Etheostoma blennioides Rafinesque (Pisces: Percidea)," by Robert Victor Miller (reprinted from "Copeia," no. 1, Mar. 15, 1968), 40 pp., illus. The greenside darter inhabits many streams of the Great Lakes and Mississippi and Potomac River drainages. Differences have evolved among certain populations in those drainages. This paper describes the infraspecific variation and reviews the biology of this species.

LINE-FISHING

"Line-Fishing on the Continental Slope. II," by G. R. Forster, article, "J. Mar. Biol. Assoc. U. K." (1968), vol. 48, no. 2, pp. 479-483. This is a report on experimental line-fishing carried out from 150 miles WSW of Scilly to about 100 miles south of Ushant, from 1964 to 1967. During 3 different cruises, 163 deep-sea fish were caught from 28 line hauls, in depths of 1,000 to 3,300 m. Slightly more than half the catch consisted of elasmobranchs; the largest individual fish was a shark (Pseudotriakis microdon), 2.25 m. long, taken from 1,400 m. Catches from around 3,000 m. were just as large as those from 2,000 or 1,000. Below 3,000, only teleosts were taken. The need for baited hooks to be close to the bottom was amply confirmed.

NEW SPECIES

"A New Species of Sardine (Sardinella, Clupeidae) from the Marquesas Islands," by Frederick H. Berry and Peter J. P. Whitehead (reprinted from "Proc. Biol. Soc., Wash.," vol. 81, 1968, pp. 209-222), Contribution No. 65, Tropical Atlantic Biological Laboratory, BCF, Miami, Fla. 33149. A sardine from the Marquesas Islands was introduced into Hawaiian waters as a bait fish in 1957 and has successfully reproduced there. The authors, finding that it lacked a valid scientific name, have described it as a new species, Sardinella marquesensis.

"Centropyge eibli n. sp. from Nicobar (Pisces, Percoidea, Pomacanthidae)," by Wolfgang Klausewitz, trans. from the German by Alexander Dragovich, 6 pp., illus., BCF Trans. No. 17, Tropical Atlantic Biological Laboratory, Miami, Fla. 33149. Among the fishes collected during the last Xarifa-Expedition in the region of Nicobar, three specimens of Centropyge seemed to be a new species. Finding no previous description, the author has described Centropyge eibli in this paper.

OCEANOGRAPHY

"National Oceanographic Data Center Highlights 1968," 20 pp., illus. Single copies available free from National Oceanographic Data Center, Washington, D. C. 20390. The mission of the Center is to "acquire, process, preserve, and disseminate unclassified oceanographic data for scientific, industrial, and defense purposes." This booklet summarizes the Center's activities for fiscal year 1968.

"Eastropac Information Paper 8," Fishery-Oceanography Center, La Jolla, Calif., 1968. This information paper is the second of a series of working documents for those processing or interested in EASTROPAC data. It consists of station lists summarizing the observations made. It covers the period April 1967 to January 1968.

OIL POLLUTION AND OIL-SPILL REMOVERS

"Oil from the 'Torrey Canyon'," by Angela Croome, article, "Sea Frontiers," vol. 14, no. 3, May-June 1968, pp. 138-149, illus. The wreck of the Torrey Canyon and its pollution of the beaches of southwest England and Britanny was a squalid disaster with squalid consequences. Although the gross bird mortality was due, directly or indirectly, to oil pollution; the principal damage to marine life came from detergents used to remove the oil. This was especially true along the shoreline, where the chemicals were applied indiscriminately, in heavy concentrations, and persistently. Littoral life was relatively unaffected by the oil, even on heavily contaminated beaches. There was some damage to anemones, but most molluscs were imprevious; limpets and winkles continued to browse and move about on oil-contaminated rocks. The enormous quantities of detergents dispensed on the shore changed the scene dramatically. Molluscs, crustacea, rockpool fish, worms, anemones, marine algae, and other littoral flora and fauna were decimated. Many bivalves, starfish, and sea urchins died, and many of the inshore crabs still alive were without claws and legs. How serious the effect was on plankton and fish larvae is still unknown, but emulsifying chemicals rupture the membranes of their cells. Miss Croome, telling the whole sad tale, has recommended rules to be followed in any like disasters.

"Toxicity of Oil-Spill Removers ('Detergents') to Marine Life; An Assessment Using the Intertidal Barnacle Elminius modestus," by E. D. S. Corner, A. J. Southward, and E. C. Southward, "J. Mar. Biol. Assoc. U. K.," 1968, vol. 48, pp. 29-47. During the first few weeks following the stranding of the 'Torrey Canyon,' and the release of its cargo of crude oil, information was urgently needed on the

poisonous effect of the detergents used to emulsify the floating oil and to remove oil washed up on the rocks and sand along the coast. As evidence about a widely distributed intertidal animal would have general significance, the barnacle Elminius modestus Darwin was chosen for the experiments described in the article. Evidence was found that very low concentrations of detergent can have long-term toxic effects, inhibiting growth and normal development, and even causing death. There is also reason to suppose that some animals, encountering the detergent for only a short time before moving into uncontaminated areas, will carry with them the seeds of eventual destruction.

"Long-Term Effects of Low Concentrations of an Oil-Spill Remover ('Detergent') Studies with the Larvae of Sabellaria spinulosa," and "Temporary Adsorption on a Substrate of an Oil-Spill Remover ('Detergent'): Tests with Larvae of Sabellaria spinulosa," by Douglas P. Wilson, article, "J. Mar. Biol. Assoc. U. K.," 1968, vol. 48, pp. 177-208. The articles describe two experiments with the detergent BP 1002. Larvae immediately detected the detergent, at concentrations of 1 ppm, and were intensely irritated by it. Placed in loosely covered vessels (the solvent fraction was allowed to evaporate) larvae seemed to recover at first but died several weeks later; control larvae remained active and normal. Surfactant and stabilizer fractions at concentrations of 2.5 ppm killed the larvae within a day or two. In the second experiment, sand was soaked for 90 min. in sea water containing the detergent in concentrations of 1,000 and 100 ppm (-mg/1.) and then thoroughly washed. Larvae crawling on it soon afterwards were damaged, but the toxic effect disappeared after some days.

OYSTERS

"The Mississippi Oyster Industry," by Bruce W. Maghan, Fish and Wildlife Service, Dept. of the Interior, FL-607, Dec. 1967, 12 pp., illus. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209. Mississippi coastal waters have been a source of oysters since precolonial days; the eastern oyster reaches marketable size in 2 years in Mississippi. This report describes how productive areas are maintained and how certain reefs are lost because of municipal and industrial wastes. The report includes methods and equipment used to harvest oysters, annual landings and value, and the number of men in the fishery.

"Oyster Mortalities, with Particular Reference to Chesapeake Bay and the Atlantic Coast of North America," by Carl J. Sindermann, Fish and Wildlife Service, Dept. of the Interior, SSR-569, 1968, 10 pp., illus. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209. A number of recent mass mortalities of oysters of the Middle Atlantic States, and elsewhere, have been attributed to the effects of disease. This paper summarizes recent information about mass mortalities, their effects on the American oyster, Crassostrea virginica, and industry--and offers methods of disease control.

REARING EXPERIMENTS

"Rearing Herring Larvae to Metamorphosis and Beyond," by J. H. S. Blaxter, "J. Mar. Biol. Assoc. U. K.," 1968, vol. 48, pp. 17-28. The use of natural plankton and other foods, and of transfer techniques during phases of mortality before metamorphoses, has made it possible for substantial numbers of herring larvae to be reared beyond this stage; these supply requirements for experimental work. It had been hard to prevent a steady mortality in previous rearing methods. This paper describes modifications derived from experiments during the spring herring spawning seasons in 1963, 1964, 1966, and 1967.

SALMON

"The Sockeye Salmon," by Russell E. Foerster, Fisheries Research Board of Canada, illus., C$8.00. Available from the Queen's Printer, Ottawa, Ont., Canada. The author presents the information he has gathered during 40 years of research into the life history, propagation, and ecology of the sockeye salmon. His studies include the fishery, spawning, migrations, lake life, marine life, artificial propagation, and crossbreeding the species.

"Canada's Pacific Salmon," by Roderick Haig Brown, Department of Fisheries, Ottawa, 1967, 29 pp., illus. Available from the Queen's Printer, Ottawa, Ont., Canada, cat. no.: Fs 34-1967/1. Scientists have learned much about the movements and habits of the genus Oncorhynchus in recent years. Research and fishing experience have yielded

sufficient information to enable conservation-minded governments to ensure that the salmon's existence is not jeopardized. This is the story of the 5 species of Pacific salmon as it has emerged to the present time. It is a dramatic story that should be widely known. No other resource offers mankind so much in return for so little.

"Models of Oceanic Migrations of Pacific Salmon and Comments on Guidance Mechanisms," by William F. Royce, Lynwood S. Smith, and Allan C. Hartt, Fish and Wildlife Service, Dept. of the Interior, 1968. (Reprinted from Contribution No. 269, College of Fisheries, Univ. of Wash.) Fishery Bulletin, vol. 66, no. 3, pp. 441-62, illus. Available free from Branch of Reports, Publications Unit, 1801 N. Moore St., Arlington, Va. 22209. The return of the salmon to its home stream, to the part of the stream where its parents spawned, or even to the hatchery where it was reared as a fry, has been well documented. The appearance of the salmon in coastal waters and its final ascent of the stream are only the last acts in a most remarkable series of migrations that has been studied only recently in enough detail to permit a reasonably comprehensive description. This report constructs models of the ocean migrations of 3 typical stocks originating in diverse geographical areas: southeastern Alaska and central British Columbia pink salmon; East Kamchatka pink salmon; and Bristol Bay sockeye salmon. The models illustrate the features of the migration, the navigational problems, and the kinds of position- and direction-finding information presumed to be available to the fish.

TRANSLATIONS

"Translations on USSR Fishing Industry and Marine Resources," 1968, Clearinghouse, U. S. Department of Commerce, Springfield, Va. 22151. A series of reports formerly sold by the Joint Publications Research Service, now available only from the Clearinghouse. Single copies $3.00 and annual subscription $18.00 ($22.50 for overseas). These are translations of current articles from Soviet fishery and oceanography publications on a wide variety of subjects: species, insulation for refrigerated ships, crab processing, new commercial fishing regions, sea farms, purse seining, fishery statistics, electrical fishing devices, and industry trademarks. Write the Clearinghouse for further information.

An English edition of the Soviet journal "Voprosy Ikhtiologii" (Problems of Ichthyology) is being published by the American Fisheries Society, 1040 Washington Bldg. NW., Washington, D. C. 20005. A single issue is $18 and an annual subscription (6 issues) $48. Two issues are already available.

Two papers, published in 1968, by the French Office of Scientific and Technical Research Overseas (ORSTOM), translated by Salvatore DiPalma, may be borrowed from Branch of Foreign Fisheries, BCF, Dept. of the Interior, Rm. 8015, Washington, D. C. 20240. "Notes on Spanish Shrimp Fishery of the Coast of Congo and Angola" (ORSTOM doc. no. 422 S.R.), by A. Crosnier and J. J. Tanter, covers nets, species and their sizes, fishing areas and depths, yields, treatment of catch on board and marketing. "Observations on Possibilities for Development of Shrimp Fisheries on the Ivory Coast" (ORSTOM prov. scientific doc. no. 20), by J. P. Troadec, examines the biology of commercial shrimp of the continental shelf, marine and lagoon fishing, fishery abundance and profitability, and culture.

--Barbara Lundy

INTERNATIONAL

FAO Experts Assess Tuna Stocks in Atlantic & Indian Oceans

Fishery scientists from the U. S., Japan, France, and the Congo (Brazzaville) met at BCF's Tropical Atlantic Biological Laboratory (TABL), Miami, Florida, Aug. 12-16, to assess tuna stocks in the Atlantic and Indian Oceans. The meeting was sponsored by the UN's Food and Agriculture Organization (FAO).

The group considered longline and surface fisheries in the Atlantic and Indian Ocean for yellowfin tuna, albacore, bigeye tuna, the bluefin tunas, and skipjack tuna. Stock separation, catch and effort data, biological data, and status of stocks were examined. The experts found many parallels between the status of stocks in the Atlantic and Indian Oceans.

Their preliminary conclusions were:

The Atlantic

The major Atlantic tuna fisheries are the longline fisheries, chiefly for yellowfin, albacore, and bigeye, which now cover most of the tropical and temperate waters of the Atlantic; surface fisheries, mainly purse seine and live bait, for yellowfin, skipjack, and bigeye tunas along the West African coast; and trolling and live-bait fishing in the Bay of Biscay region for small albacore and bluefin tuna.

The Japanese longline fishery started in 1956 and increased continuously until 1965. Some decrease in Japanese fishing in recent years has been offset by increased fishing by longliners from South Korea and China (Taiwan). The longline fishery initially concentrated on yellowfin; later, as yellowfin abundance decreased, attention was transferred to albacore. The effort in surface fisheries also is increasing; French and Spanish vessels are being joined by vessels from the U. S., Japan, and West African countries.

State of the Stocks

The stocks of large yellowfin on which the longline fishery is based have been greatly reduced by fishing. Any additional increase in longline fishing would, at best, increase the total longline catch only marginally--and might well decrease the total longline catch. Further, increased fishing will certainly continue to decrease the catch per unit effort.

The surface yellowfin fishery is based on smaller fish. This fishery has reduced the recruitment to the yellowfin longline fishery. The presence of the surface fishery may increase the total Atlantic yellowfin catch; it is unlikely to decrease it. However, if the minimum size of fish taken in the surface fishery is decreased, the total catch will almost certainly be decreased.

The longline albacore, and possibly bigeye stocks, also are heavily fished. Increased longline fishing would give little or no increase in albacore catches, though it may be possible to increase bigeye catches. Increased fishing will decrease the catch per unit effort, particularly for albacore. The relation between the surface and the longline fisheries for albacore in the North Atlantic is unknown.

The bluefin stocks do not appear to be large; the group of small bluefin fished off New England is small and heavily exploited.

The skipjack stock appears large; the present small catches can be increased.

Indian Ocean

The history of the longline fishery is similar to that in the Atlantic and the Pacific--increasing Japanese fishing since about 1952 and, more recently, increased fishing by China (Taiwan) and South Korea. Initially, the Japanese catches consisted mainly of yellowfin, but now contain approximately equal catches of yellowfin and bluefin, and less albacore and bigeye. The major surface fisheries are on the eastern boundaries of the Indian Ocean--for bluefin off Australia, and for yellowfin and other species around Indonesia. Another surface fishery is developing off Somalia.

The yellowfin stocks in the Indian Ocean are probably independent of those in the Atlantic. However, there is apparently some intermixing of albacore, bigeye, and bluefin around South Africa.

The state of the stocks is similar to those in the Atlantic. The stocks of all 4 species are heavily fished by the longliners. Increased longline fishing will not increase appreciably (and may decrease) the total yellowfin, bluefin, and albacore catches, though some increase in bigeye catches may be possible. Increased fishing will reduce the catch per unit effort of all 3 species. The effects of the surface fishery for bluefin on the longline fishery is not known.

The major opportunity for increasing appreciably the Indian Ocean tuna catch is with skipjack; these stocks appear large. Increased catches might result from surface fisheries of bluefin and yellowfin. (The experts lacked information to examine these possibilities.)

Need for Statistics

There is an urgent need to improve the statistics of total landings, species composition, and fishing effort. Because of the nature of the fisheries--long-range vessels and landings in foreign countries--the collection, tabulation, and publication of detailed statistics might be better done for the world as a whole, rather than for each ocean.

The Panel

Members of the FAO Working Party of Tuna Stock Assessment are: J. A. Gulland, FAO (Convenor of meeting); J. Joseph, IATTC; J. C. Dao, France; J. C. Le Guen, Congo (Brazzaville); B. Rothschild, M. B. Schaefer, J. P. Wise, U. S.; I. Yamanaka and A. Suda, Japan.

Background of FAO Study

World catches of tunas and related fishes have increased from 920 metric tons in 1948 to an estimated 1,400-1,500 metric tons in 1968. Most tuna catches are made in the tropical and temperate parts of the oceans. FAO convened the World Scientific Meeting on the Biology of Tunas and Related Species in California in 1962. A 4-volume report of this meeting was issued.

Because the tuna fisheries are carried out principally on the high seas, effective conservation regulations can be carried out only on an international basis. International organizations already deal with these matters in the Indian Ocean and the Pacific Ocean: the Indo-Pacific Fisheries Council and the Inter-American Tropical Tuna Commission (IATTC). The IATTC is regulating tuna catches in the eastern tropical Pacific.

The Atlantic tuna fisheries began to increase dramatically in the late 1950s. Alert to the need for international study and possible control, FAO called a conference in Rio de Janeiro, Brazil, in May 1966 to begin forming a research and regulatory body for Atlantic tunas. The result was adoption of the International Convention for the Conservation of Atlantic Tunas. This convention will become effective when ratified by 7 nations. The U. S., Japan, South Africa, and Ghana have ratified it; France, Spain, and Canada are expected to ratify shortly.

Partly to facilitate attainment of the Convention's purposes, FAO early in 1968 began to set up a Working Party on Tuna Stock Assessment. Such parties are made up of experts in particular fields who meet at FAO's expense to study problems and to recommend solutions. The scientists are chosen by FAO and do not represent their nations or governments. They draft a report, which FAO submits to its members.

Norway Stops Danish and Swedish Fishing in 12-Mile Limit

The Norwegian Government has decided to terminate Danish and Swedish fishing in the 12-mile limit, west and north of Norway's southernmost point, no later than Oct. 31, 1970. Shrimp fisheries of Denmark and Sweden will be affected most. Norwegian fishing in the 12-mile limit off Denmark's west coast also will be terminated.

Other Agreement Continues

The special agreement permitting the 3 countries to fish up to a line 4 miles from the coastwise baselines in the Skagerrak and Kattegat, east and north of the southernmost point of Norway, will be continued. (Asst. Reg. Fisheries Attaché, U. S. Embassy, Copenhagen.)

EFTA Keeps Trade Restrictions

At its last meeting, the Council of Ministers of the European Free Trade Area (EFTA) agreed to explore possible trade expansion among member countries. Willingness of EFTA countries to act on this recommendation was tested in June, when a working group in Geneva discussed trade in fish and fishery products. The group concluded that removal of restrictions on fishery commodities was not possible. A completely negative report was submitted to the EFTA Council. (Asst. Reg. Fisheries Attaché, U. S. Embassy, Copenhagen.)

EEC Common Fisheries Policy Delayed

The EEC Common Fisheries Policy did not take effect on July 1 as originally planned. Probably several months or a year will elapse before the policy is effected. Common Market imports of some agricultural commodities have almost ceased as a result of the protectionist nature of the common EEC agricultural policy. Such effects are not likely to result from the fisheries policy, because EEC countries will continue to require large quantities of fish products from nonmember countries. (U. S. Embassy, Copenhagen.)

USSR & Pakistan Sign Fisheries Aid Agreement

A USSR-Pakistan 2-year fisheries aid agreement was signed in Moscow during the summer. Under the agreement, the USSR will help Pakistan study fishery resources off her coasts, train fishery specialists, and, if requested, draft a feasibility study for construction of a new fishing port on the Arabian Sea coast. The Soviets will also send 3 fishery research vessels to explore local fishery resources; Pakistani fishery scientists will participate. (TASS.)

Wants New Resources

Pakistan claims that Arabian Sea coastal fishery resources are overfished and wants new ones found 10-30 miles offshore. The Bay of Bengal area is being explored by an FAO-sponsored team of fishery scientists, including 2 biologists from the Soviet research institute ATLANTNIRO.

Netherlands Sends Shrimp Trawlers to Persian Gulf

A new shrimp trawler, catcher, and processing factory in a hull less than 90 feet long has sailed from the Netherlands to Dubai on the Persian Gulf. The vessel, "Alibut I," a twin-boomed, double-rigged trawler, has enough cleaning and freezing equipment to produce daily 4-6 metric tons of unshelled, heads-off shrimp.

She will work with a catcher vessel offloading shrimp for the U. S. market to refrigerated transports at sea. Owner is Gulf Marine & Diving Co. Ltd. ("Fishing News International.")

Symposium on Ocean Bottom Held in Stockholm

An International Institute for Peace and Conflict Research (SIRPI) symposium on the ocean bottom was held in Stockholm, June 10-14. Seven countries, including the U.S., sent delegates. The agenda included acquisition of mineral resources, acquisition and control of marine fishery resources, military uses of the continental shelf and the seabed beyond, and scientific research in the oceans.

Symposium Recommendations

The Symposium recommended that no government should claim more than a 12-mile territorial sea, and that early consideration be given to establishing an intergovernmental ocean organization. (U. S. Embassy, Stockholm.)

USSR to Aid Algerian Fisheries

Algeria has concluded a Technical Assistance Agreement with the Soviet Union to develop Algerian industry. Fisheries will be one of the 12 industries to receive Soviet aid.

Technical Assistance

According to the Algiers newspaper, "El Moudjahid," the 3 phase Agreement will last for several years. Between 1968 and 1972, the Soviets will make "commercial offers" of exploratory research vessels and fishing trawlers to Algeria. Later, feasibility studies will be made on fishing port improvement, loading and unloading facilities, production improvement, and establishment of fish inspection. Finally, the Soviets will train Algerian fishery specialists.

Other Aid Agreements

The Agreement is similar to others the USSR has concluded with developing countries, but its provisions are more extensive. Other assistance to Algerian fisheries came in 1965-early 1966 when Yugoslavia built 5 fishing vessels for the Ministry of Economic Development. Purchases were financed with Yugoslav credits granted to Algeria. In 1963, the Bulgarian Communist Party stated that "Bulgarian fishery experts will go to Algeria. . .and other Mediterranean countries to study marine fishery resources. . .and to conclude agreements for entry into their ports." Apparently this plan never materialized.

Algerian Landings

Algeria needs to develop her fishing industry. In 1966, landings were 20,300 metric tons, mostly pilchards; 10 years before, landings were 22,300 tons. At the same time Morocco, Algeria's neighbor on the Atlantic, had increased her catches from 112,000 metric tons in 1956 to 303,000 in 1966.

Indian Ocean Yellowfin Catch Declined

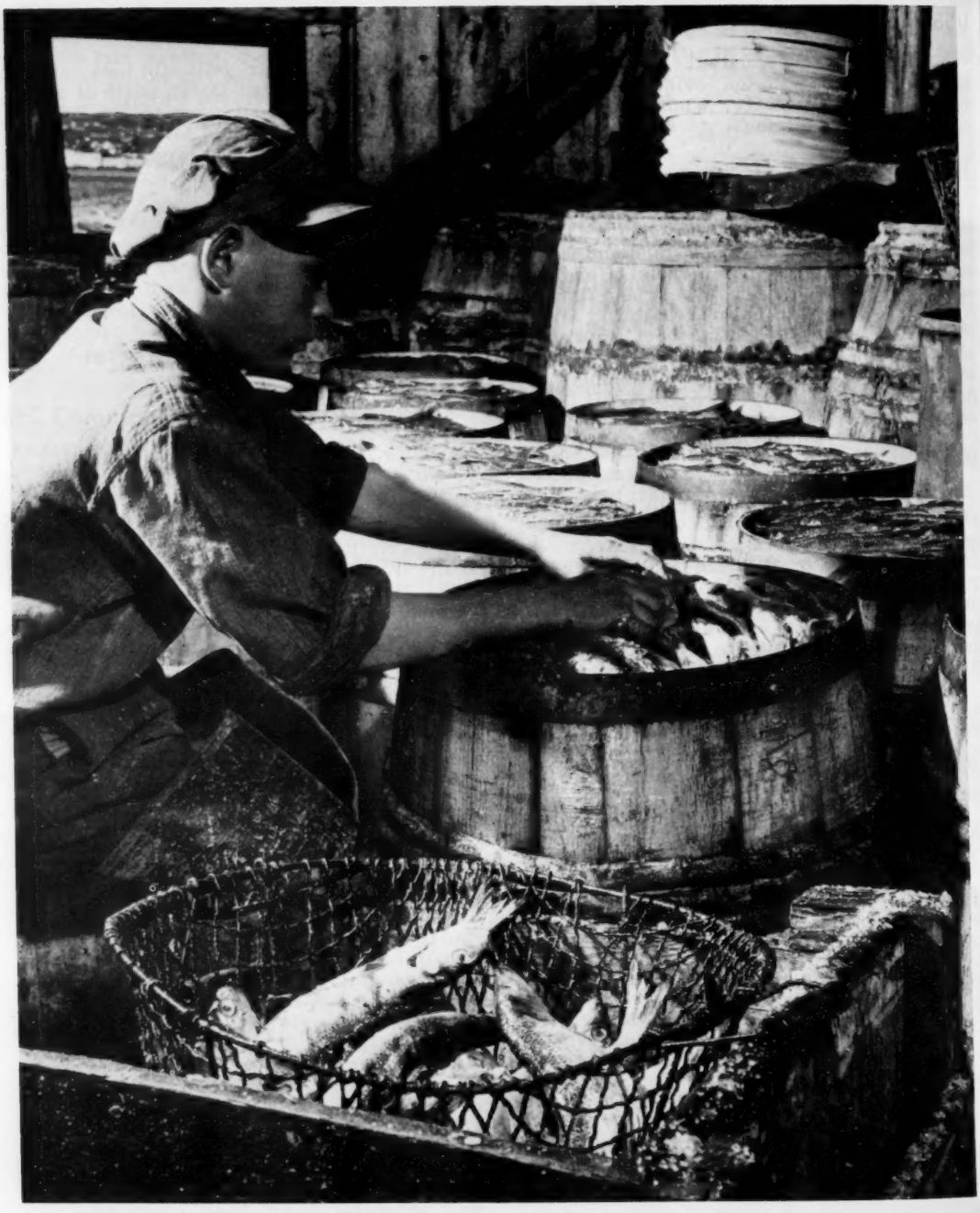
In early September, yellowfin tuna catches in the western Indian Ocean north of Malagasy declined to an average 2.5-2.8 tons per vessel per day. From October 1967 until this summer, fishing was excellent and vessels were averaging 5-6 tons a day. At present about 30 Japanese long-liners and 60 other foreign tuna vessels are fishing in the western Indian Ocean. ("Suisan Tsushin," Sept. 7.)

Mauritanian Fisheries Director Visits Japan

The Bottomfish Trawlers Association invited the Mauritanian Fisheries Director to visit Japan in late August or early September. The invitation was extended to promote friendship and goodwill and to provide an opportunity for informal discussion of an agreement permitting the Japanese to trawl inside Mauritania's 12-mile exclusive fishery zone.

Terms of Possible Agreement

The Association sent a mission to Mauritania in July 1967 to discuss a possible agreement. At that time Mauritanian officials agreed to permit Japanese fishing, if the Japanese would train Mauritanian crews, build and operate cold storages, assist in building vessel and gear repair facilities, and provide fishery consultants. Some Japanese question the merit of investing in Mauritanian fisheries in exchange for the right to fish for species like octopus and squid, which are marketable only in Japan, Italy, and Spain. ("Suisancho Nippo," Aug. 12.)



Nova Scotian youngster packs salt herring for export. Fish are pickled in tubs of brine. (Photo: National Film Board)

FOREIGN

CANADA

ONTARIO PRODUCES MORE FISH

Ontario commercial fishermen landed 12.8 million pounds of fish during the first 4 months of 1968, about 7.5% greater than for the same period last year, according to preliminary figures released by the Department of Lands and Forests. This increase came from the northern inland waters and all the Great Lakes, except Georgian Bay and Lake Huron.

The fishermen's revenue was nearly C$1.2 million. It increased correspondingly with the fishing area despite the reduced catches in Lake Huron. Lake Erie, where nearly five-sixths of the fish were landed, was a notable exception. There, catch value declined in spite of a 4.5-percent increase in landings. The entire provincial catch value is down 3.5% because of the Lake Erie decrease.

The fishing industry requested a closed season and quotas on Lake Erie yellow perch to avoid oversupply. This reduced yellow perch landings to 1 million pounds. A spring price of 7 cents a pound, compared with 10 cents a pound last year, also reduced Lake Erie catch value. (Ontario "Newsletter.")

* * *

BRITISH COLUMBIA SALMON CATCHES

Record sockeye salmon runs in Rivers and Smith Inlets in British Columbia, and good catches of pink, chum, and coho have resulted in a C$24.5 million fish landing value for the July period, nearly C$7 million more than the previous July high of C$17.6 million in 1966. Salmon landings were worth C$22.9 million ex-vessel, halibut C$1.2 million, and other fish, including shellfish, C$400,000.

A total of 79 million pounds of salmon were landed; 34 million pounds of net-caught sockeye valued at C$12.8 million; nearly 20 million pounds of net-caught pinks worth C$2.5 million to fishermen; trollers landed 7.8 million pounds of dressed coho, valued at just over C$3 million.

Chum salmon landings, mainly from northern areas, were 7.8 million pounds worth just under C$1 million; the highest landings and value of chums for July since 1955.

Seiners and gill-netters landed 7.5 million pink salmon, but they were exceptionally small, averaging only 2.6 pounds, compared to a normal July average of about 4.4 pounds. Troll-caught spring salmon amounted to 2.7 million pounds worth C$1.6 million, compared with 2.5 million pounds and C$1.4 million in July 1967.

Net-caught spring salmon landings were down, totaling 1.6 million pounds, compared with 2.2 million pounds a year ago.

Halibut landings during July (including deliveries at U. S. ports by B. C. fishermen were 5.1 million pounds as against 7.0 million pounds in 1967. ("Fisheries News," Canadian Dept. of Fisheries, Aug. 23.)

* * *

DOGFISH DIET FOR BLACK COD

The lowly dogfish, scorned as a nuisance in fishermen's nets and rejected as a food fish, may become part of the Canadian diet. The sharklike fish may be used as food for Alaska black cod, a gourmet species that can be raised in captivity.

Black Cod Adaptable

The Nanaimo Fisheries Biological Station has found that black cod, completely adaptable to pond cultivation, thrives on a diet of ground-up dogfish. The dogfish diet imparts a superb flavor to the cod. Other foods have been tried, but dogfish has proved the best. Black cod eats more voraciously and grows more rapidly when in captivity. It is an ideal subject for farming.

Dogfish Use Welcomed

There is a long way to go before cod ponds can be established, but a fish-farming program could be developed. Nanaimo scientists have determined that an Alaska cod can consume up to 5 pounds of dogfish for each pound it gains; in early growth stages it converts a pound of dogfish into a pound of cod. As the dogfish has little or no commercial value, any effort to use and control it would be welcomed. (Canadian Dept. of Fisheries, Oct. 4.)

The day's salmon catch is weighed prior to bidding at St. Jean de Luz, France. (Photo: International Labour Office)

EUROPE

USSR

FISHERIES MINISTRY TO SELL SEAFOOD IN MOSCOW

The Fisheries Ministry will take over the sale of fishery products in Moscow on an experimental basis. The Ministry will supply retail food stores and markets with fish and fishery products. Transportation facilities will be provided by the City Administration.

Cold-Storage Facilities

The Moscow Fisheries Combine, the Moscow Harbor Cold Storage Plant, and several other cold-storage facilities in Moscow, formerly under the Ministry of Trade of the Russian Republic (RSFSR), will be turned over to the Federal Fisheries Ministry.

Activities of New Unit

A new unit, MOSRYBA, has been created to supervise and coordinate the operation. MOSRYBA will organize a continuous supply of high-quality fishery products; sell to markets and retail stores; assist retailers in promoting sales and try to increase consumer demand. ("Ekonomicheskaia Gazeta," March 1968; "Rybnoe Khoziaistvo," Nov. 3.)

* * *

CAVIAR SHORTAGE

A caviar shortage, caused by low catches of Volga sturgeon, was reported by the Associated Press from Moscow. Because of hydroelectric power dams on the Volga, increasing pollution, and overfishing, it is feared that Caspian sturgeon stocks are becoming extinct. A Fisheries Ministry official, V. S. Maliutin, has called for restoration of sturgeon "to its former glory." ("Japan Times," July 16.)

Exports

The caviar export trade suffered a reverse in 1963-64 when stocks sold to Western Europe were returned because of an off-odor, apparently caused by polluted waters. In 1966 only 699 metric tons were exported, worth US$2.9 million, but in 1967 exports increased 28%, to 900 tons worth US$5.1 million. It is possible that the reported domestic shortage was caused by increased exports.

Catches Are Declining

What really worries Soviet fishery officials, however, are smaller catches of sturgeon indicating decreasing stocks. During 1958-62, the Volga sturgeon catch was about 50-60% of the world's catch. In 1962, the Soviet sturgeon catch was 22,100 metric tons. Catch has decreased each succeeding year until in 1966 it sank to 15,100 tons. Hatcheries producing 50 million fingerlings a year have been set up on the Volga and Kura rivers. The Ministry of Fisheries, however, believes that 70 million fingerlings each year will be needed to reestablish stocks.

* * *

FAILS TO PROVIDE CARRIERS AND PROCESSING VESSELS FOR HER FAR EAST FISHERIES

Fishermen from Kamchatka Peninsula, who overfulfilled the catch plan for first-half 1968, had serious trouble with the Far-eastern Fisheries Administration ("Dal'ryba") this past summer. The agency had not supplied the necessary refrigerated fish carriers and processing vessels.

Eighteen trawlers in the Sea of Okhotsk were drift-netting for herring; daily catches ranged 600-700 metric tons. Despite promises from "Dal'ryba," no refrigerated fish carriers or factory vessels arrived to offload them. The catches remained for days aboard the trawlers.

20 Seiners Await Carriers

In the Gulf of Anadyr, western Bering Sea, 20 seiners were laid up because no carriers or factory vessels came to offload. The seiners caught an average 250 tons of cod daily; this could have been increased to 400 had motherships been available. A similar situation existed off Karagin Island and Cape Olyutorskii.

The planned July Kamchatka 31,500-ton catch would not be fulfilled if "Dal'ryba" failed to provide transport and processing vessels. ("Vodnyi Transport.")

* * *

USSR (Contd.):

FISHERY PROBLEMS IN
THE SOUTHEAST ATLANTIC

Black Sea Fisheries Administration fishermen in the southeast Atlantic have 3 major problems:

Exploratory Fishing

Medium trawlers cruise in the fishing area, make sample trawlings, study hydrology, etc., but fail to direct the fleet to fish schools as soon as they are discovered. Moreover, medium trawlers are not equipped to explore at 1,200-1,500 foot depths where fish suitable for filleting are often found. To be of use to the large vessels working in the southeast Atlantic, exploring should be done by large freezer stern trawlers of the "Tropik" or "Atlantik" classes.

Transport and Transshipment

Catch-loaded vessels are frequently forced into demurrage for several days because of a severe shortage of refrigerated fish carriers. Transshipment to fish carriers is badly organized. Trawlers often unload only part of their holds to one carrier, an inefficient practice that causes a considerable loss of time and money.

Transshipment is much two slow because fish meal is transshipped to Merchant Marine Ministry tankers unequipped for this kind of operation on the high seas. Furthermore, vessels lose hours, and sometimes days, traveling to and from tankers located outside the fishing area.

Profits and Catch Quotas

Quality matters more than quantity. Fewer tons of high-quality fish are more profitable than more tons of low-grade fish. Despite this, all fishing vessels, including those operating under the new system, hang on to the old catch quota as a prime productivity index. Every day they must decide whether to fish for valuable food fish (hake, for instance) and jeopardize catch quotas, or take unutilized fish (such as horse mackerel, or trash fish suitable at best for fish meal) and overfulfil the quota. The problem is tough, because consumers do not want the presently unutilized fish that will make up the catch quota. ("Ekonomicheskaia Gazeta," No. 32, Aug. 1968.)

* * *

TRAWLERS FISH
OFF NORTHWEST AFRICA

The Soviet factory stern trawler BMRT-355, "Maiakovskii" class, 3,170 gross tons, fished off northwest Africa, on the Cape Verde Plateau, between 19°15' and 19°51' N., in mid-1968. This new fishing area for the Soviets, a shelf divided by 5 canyons, is hard to trawl.

Method

The trawl was set on sandy bottom at depths ranging from 110 to 200 meters (361-656 feet), at one end of a small shelf terrace. It takes 5 to 7 minutes to cross the terrace at full speed. The trawl is hoisted at the other end, where the terrace drops off into a canyon.

Catch

The trawler fished for snapper and hake. Average hauls were 1.5 to 4 metric tons. Average daily catch was 35-45 tons, after 18 to 20 hauls. BMRT-355 caught 2,000 tons of fish in about 2 months, for a net profit of 182,000 rubles (US$200,000). ("Rybnoe Khoziaistvo".)

* * *

EXPANDS FISHERIES OFF SIBERIA

The only area of the Arctic Ocean fished commercially by Soviet vessels is the Barents Sea. Murmansk, one of the largest centers of the fishing industry, is there. Fishery resources of other waters off the Siberian coast, the Kara, Laptev and East Siberian Sea, are unutilized and unexplored. This is true also of the estuaries of the great Siberian rivers (Ob, Lena, Yenisey, Khatanga, Kolyma, etc.) more populated than the icy expanses of the Siberian seaboard.

Research Urged

Soviet ichthyologists are being urged to locate and delineate the fishery resources and study the species in those waters. Coastal areas of the Laptev Sea are believed to have commercial concentrations of fish.

USSR (Contd.):

Future Expansion

It is presently impractical to expand commercial fishing fleets in the Arctic Ocean because of water conditions and because known fish schools are too small to have commercial value. However, Siberian fisheries can be expanded by setting up shore centers provided with small supply vessels, 5 or 6 airplanes and helicopters, and gear and processing plants. A well-organized fishing industry in the Siberian Arctic might yield large amounts of valuable fish for the consumer market. ("Rybnoe Khoziaistvo.")

* * *

EXPANDS FISHERIES IN BAY OF BENGAL

The Far-Eastern Fisheries Administration is planning to expand operations in the Indian Ocean. The freezer trawler "Akustik," on an exploratory cruise in the Bay of Bengal off the Andaman Islands, will be joined by the trawlers "Astronom," "Aviator," and "Koritsa." This is the first exploration by Soviet Far-Eastern fishermen in the Bay of Bengal.

* * *

PURSE SEINER MAKES RECORD CATCH

The RS-300 class seiner, "Kosmonavt Komarov," has caught 14,480 metric tons of fish in 2½ years, Jan. 1966-June 1968. This is more than 10% above 13,000-ton catch quota assigned to RS-300 class for entire 5-Year Plan, 1966-1970.

For second time in 2 years, Kosmonavt Komarov established an annual record. In 1966, she set an official All-Union record with 5,634 tons; in 1967, her annual catch exceeded the previous record by 166 tons.

* * *

A HISTORY OF PURSE SEINING

The Soviets first attempted purse seining in the 1920s and early 1930s off the Murmansk coast, in the Black Sea, and in the far eastern waters. Results were poor, so the gear was discontinued and the seiners used to carry freight.

Improved net design, and adoption of a Japanese-designed seine-hauling machine, revived Pacific purse seining in the late 1930s. Most purse seining was done from "Kabasaki," the 13-14 meter (42.6-45.9 foot) long motorboats used in coastal fishing, with 500 meter (1,640 ft.) seines.

After World War II

Shortly after World War II, a Soviet-designed 300-horsepower seiner was adopted in the Far East, on the Black Sea, and along the Murmansk coast. The RS-300 seiners developed from those a few years later still yield excellent results purse seining for herring, and trawling for demersal fish in the Soviet Far East. Catches average 1,000 metric tons for a few months of seasonal fishing. Aerial reconnaissance for spotting commercial concentrations of fish has increased the Pacific seiner fleet's effectiveness.

Current Plans

In 1967, the Sakhalin Administration equipped 6 "Okean" class medium side trawlers for purse seining. Six medium trawlers and 5 RS-300 seiners, using 1,200-meter (3,936-foot) seines, fishing mackerel off Hokkaido, caught 9,000 tons in 2 months. In 1968, plans of the Far Eastern Administration call for equipping another 40 medium trawlers to purse seine mackerel and jack mackerel.

Purse seining developed in the European USSR on a large scale in 1966. The Murmansk fisheries also used RS-300 class seiners and converted "Okean" class medium trawlers. From June to December 1966, 15 "Okean" class trawlers purse seined herring in the Norwegian Sea; catches ranged from 1,000 to 1,800 tons per vessel. In 1967, 43 medium trawlers of the Northern and Western Administrations purse-seined in the Norwegian and North Seas; catch was about 100,000 tons. These Administrations are converting 80 more vessels to purse seining, mostly "Okean," "Maiak," and RS-300 classes.

* * *

WATER POLLUTION CONFERENCE

The first All-Union Conference on Water Pollution, attended by 400 scientists and specialists, was held at Moscow University in February. A meeting will be held every 4

USSR (Contd.):

years. Soviet scientists believe that water pollution is inhibiting industrial and city growth and that clean water shortage is increasing catastrophically.

Subjects Presented

The "keynote" paper covered the pollution rate of inland fishery water bodies, the most effective means of protection against it, and gave the maximum permissible concentrations of toxic substances tolerated by fish eggs, larvae, fry and adult fish, on which to base regulation of industrial sewage, wastes from timber rafting, etc.

Other papers described the effect of organic phosphorus and its compounds, metal-organic compounds and polymetallic ores on fish, invertebrates, and algae; the effect of phenols on certain functions in fish, and on the photosynthesis of CHLORELLA; and the pollution of rivers, reservoirs, and inland seas. Principal pollutants of inland waters were defined as oil and oil products; industrial, urban and rural sewage; poisonous chemicals; detergents; and timber wastes.

Conclusion

The participants deplored the increasing pollution of fresh and ocean water, urged expanded research on the effect of pesticides, detergents, and other poisonous chemicals on hydrobiological processes and on water living organisms, and recommended measures to prevent water pollution such as breeding detoxicating organisms. ("Giodrobiologicheskii Zhurnal," No. 4.)

* * *

RAILROAD CAR TRANSPORTS LIVE FRESH-WATER FISH

The Soviets have designed a railroad car to transport live fresh-water fish over long distances. The all-metal car is divided into 3 sections. One contains 2 diesel generators and the refrigerating equipment. One is a service compartment, with a kitchen and showers, to give the service personnel maximum comfort on the trip. The third carries 2 stainless steel tanks with a capacity of 15 cubic meters.

Water in the tanks is circulated constantly and oxygen is supplied by a multijet pump. The tanks hold about 10 metric tons of fish. ("Rybnoe Khoziaistvo.")

* * *

TESTS PRESERVATION BY RADIATION

Equipment for processing fish and fish products with gamma rays will be tested on board the research vessel "Akademik Knipovich" and in a Ventspils plant, according to "Fiskaren," a Norwegian periodical. (Asst. Reg. Fish. Attaché, U. S. Embassy, Copenhagen, Sept. 17.)

* * *

WAY DEVELOPED TO WARN FISH OF UNDERWATER EXPLOSIONS

Deep seismic soundings on the ocean floor--widely used in underwater geological exploration and surveying--may be harmful to the fishing industry because the explosions kill many fish.

Recorded Voices

Soviet biologists have developed a way to warn the fish when an explosion is imminent. A loudspeaker, lowered into the water, transmits "voices" of predator fishes recorded on magnetic tape. The fish immediately flee, and the explosion can take place without damaging marine life. The device has been tested successfully. ("Rybnoe Khoziaistvo," July.)

East Germany

WINS SECOND PLACE IN WORLD FISHING VESSEL CONSTRUCTION

In 1967, East Germany ranked second in the world in fishing vessel construction. Her shipyards built 82 fishing vessels, 103,311 gross registered tons--19.6% of total world construction; Japan built 21.8%. ("Neues Deutschland" July 29.)

In first-half 1968, East Germany launched fishing vessels totaling 42,000 gross registered tons. Twenty-seven were exported to the Soviet Union, France, Norway, West Germany, and Denmark.

East Germany (Contd.):

Rated Third by Soviets

A Soviet source has rated East Germany third, with only 14% of the total. ("Vodnyi Transport.") The discrepancy may be due to incomplete data for 1967.

Plans Data Center

An electronic data center and data-retrieval system on worldwide shipbuilding developments should be completed by January 1969 for the East German shipbuilding industry. Every 4 weeks the center will issue a review of the latest developments in the industry to about 2,000 shipbuilding specialists. This must be considered an attempt by East Germany to become more competitive in selling vessels abroad. ("Ostsee-Zeitung," July 24.)

West Germany

FISHES OFF CANADA

As their herring catches in the North Sea declined, West German vessels began fishing off the Atlantic coast of Canada early in June. The vessels are supplied from the island port of St. Pierre off Newfoundland. Salted herring and frozen fish blocks will be transshipped from there to West Germany. (Fisheries Council of Canada.)

* * *

PLANS UNDERWATER LABORATORY

By May 1969, the first German underwater laboratory will be lowered into the North Sea off the island of Helgoland. After tests at about 60 feet, it will be lowered about 135 feet to the bottom. The program, designed by the German agency for air and space research, will include marine-biological and medical studies. The latter will attempt to determine how heart and blood circulation react to physical work, both in and outside the pressure chamber, and to long periods in cold water. Other studies will be made on the foods best tolerated by aquanauts. ("Vestkysten," July 10.)

* * *

TRANSSHIPS SALTED HERRING FROM ST. PIERRE

The first shipment of West German-caught salted herring from the northwest Atlantic arrived at Bremerhaven in July aboard the Dutch freezer-transport "Arctic." Four Bremerhaven herring luggers had caught the fish. The luggers, reporting continued good fishing, took some of the much-sought "full" herring and, by July 25, had landed about 4,500 metric tons at St. Pierre. (U. S. Embassy, Copenhagen, Sept. 20.)

Denmark

FISHING PORT CELEBRATES FIRST BIRTHDAY

The Danish North Sea fishing port of Hanstholm celebrated its first birthday on Sept. 8. The construction of the port was begun in 1960. Ever since 1917 other efforts to build a lasting harbor had been unsuccessful.

Drying plaice, a very valuable fish, in Denmark. Many are sold live in fish shops.

Landings

In the first year, 22,000 metric tons of fish were landed at Hanstholm. Nearly 75% were industrial fish for meal and oil production; the rest were food fish. Industrial landings brought 3 million kroner (US$400,000); food fish landings yielded about 8 million kroner ($1.1 million).

Denmark (Contd.):

Cutters Land 90%

About 90% of the landings came from cutters home ported at other places in Denmark, showing Hanstholm's excellent location in relation to major North Sea Danish fishing grounds. If Hanstholm's own fleet continues to increase as it has during this first year, within five years it will number 100 cutters. (Asst. Reg. Fish. Attaché, U. S. Embassy, Copenhagen, Sept. 20.)

* * *

LARGEST SIDE-TRAWLER BUILT

M/S "Ellen Pedersen," the largest Danish-built side trawler, is 115 feet (overall length) and 203 gross tons. Lines and stability curve of the US$279,000 vessel were determined by computer at the Danish Ship Technical Research Institute. It can be diverted to line and purse-seine fishing.

M/S Ellen Pedersen, largest Danish-built side trawler. First Danish vessel equipped with refrigerated sea-water cooling system.

Seawater Cooling System

It is the first side trawler in Denmark equipped with a refrigerated sea-water tank cooling system. The stern loading room can take herring and mackerel in seawater cooled to -1° C. (30.2° F.). This system saves work on board, and gives better room capacity use than ice cooling in wooden boxes. There are two storerooms with a total space of 8,500 cubic feet. (U. S. Embassy, Copenhagen, Aug. 9.)

* * *

FISHING SALMON OFF GREENLAND

Although the State's Ship Inspection Control office considered the vessels unsuitable for the hazardous trip across the North Atlantic, about 20 small Danish fish cutters, some only 20 GRT, fished salmon off Greenland this year.

10 Cutters in 1967

Greenland salmon fishing disappointed the 10 cutters making the trip last year; stormy weather interferred with fishing. Nevertheless, this year twice as many cutters were willing to risk everything for the chance of making a profitable catch. Danish interest was aroused when, in 1966, a Faroese line vessel caught US$200,000 worth of salmon in 3 months. (U. S. Embassy, Sept. 3.)

* * *

FISHES YOUNG HERRING IN NORTH SEA

In recent years, many small boats from the Esbjerg industrial fishing fleet have fished young herring from nearby North Sea grounds. Other countries have often criticized this fishery because of its impact on abundance of adult herring in subsequent years. The North East Atlantic Fisheries Commission (NEAFC) has discussed the desirability of protecting these young herring but has taken no action. The Danes have been told that fishing young herring definitely has an effect on late fishing of adult herring elsewhere in the North Sea, including waters off the Scottish and English coasts.

Declining Stocks

North Sea herring fishing has become more dependent on strong year-classes because the stock in the southern North Sea has been drastically reduced by ten years of intensive fishing. In the 1950's, about 200,000 metric tons were taken annually; only 5,000 tons had been taken by October this year. Criticism of the Danish small herring fishery will intensify because the year-class being fished appears strong and others will object to this heavy fishing of juvenile stages.

Criticism of Fishery

Critics emphasize two points: (1) Danish fishermen damage subsequent years' fishing--in which they themselves participate--

Denmark (Contd.):

and, (2) reduction plants do not want small fish; they are difficult to process and meal and oil yield is poor.

Needs Tagging Study

NEAFC action to protect young herring has been postponed pending further study. An extensive tagging effort is essential to determine racial composition and mortality rate of stock fished on Bloden Ground. In May 1968, the NEAFC decided that the study could not begin before fall of 1969, and would be contingent on more financial support from member countries. (U. S. Embassy, Copenhagen, Sept. 17.)

* * *

SETS MINIMUM PRICES FOR HERRING EXPORTS

Minimum prices have been instituted for whole and cut herring exported to Common Market (European Economic Community, EEC) countries. The agreement, worked out primarily between Denmark and West Germany, was reached quickly because both needed it. Denmark wanted substantially higher prices than those prevailing, while Germany wanted to avoid sales of Danish herring at "dumping" prices. Denmark was motivated, in part, by fears that Germany would request an end to the EEC customs-free quota, if low prices on Danish herring exports continued. Minimum price systems are already in effect for some Danish pond trout and fresh cod fillets exports to other European countries.

EEC Common Fisheries Policy

Because the EEC is Denmark's best customer for fish and fish products, they are extremely interested in avoiding any disruption of the market while the EEC Common Fisheries Policy is under preparation. This policy has been delayed pending agreement on territorial fishing rights. It is doubtful that agreement will be reached on these, although the rest of the policy probably will be approved. (U. S. Embassy, Copenhagen, Sept. 20.)

* * *

REGULATES SALES OF PACKAGED FRESH FISH

The growing supermarket trade in retail-packaged fresh fish in closed packages has led to a new regulation. It covers whole fish, fillets, boned herring, crustaceans, fish roe, and fish liver.

Provisions

General provisions cover quality of the raw material, processing and packaging material. Packages must be clearly marked to indicate: (1) the type of commodity, (2) net weight, (3) registration number of the producer, (4) packing date and latest sales date (not in code), and (5) the highest permissible refrigeration temperature, 5° C. (41° F.). The most noteworthy provision is that packaged fresh fish must be sold by the retail shop before close of business on the day after packaging. Eel and flatfish, whole and in pieces, may be sold no later than the second day after packing. Fresh fish can be sold only in established retail fish shops; however, special permission for sale can be obtained by supermarkets meeting hygienic requirements.

Top Quality Assured

Denmark, surrounded by productive fishing grounds, has no point more than 80 miles from the coast. Excellent quality fresh fish have been available to housewives in several hundred neighborhood fish shops. Supermarkets are taking a greater share of this trade each year, largely with retail packaged items. New regulation assures that traditionally high quality fishery products will continue to be available. (U. S. Embassy, Copenhagen, Sept. 20.)

* * *

FAROESE FISH OFF GREENLAND

A large Faroese fishing fleet of 42 distant-water long-liners, 10 trawlers, and about 100 open motorboats was fishing near Greenland early in July. Long-liners and trawlers fished cod banks off the west coast, while open boats with 4 or 5 men fished inshore. The small boats were transported in special "expedition ships" and fished from Faeringehavn, Kangarssuk, Borgshavn, and Ravns Storø.

Denmark (Contd.):

The Faroese

The total population of the Faroe Islands is less than 40,000, but the islands are well represented each year in the large commercial fleet. The Faroese were pioneers in the area. They began fishing the grounds with very small cutters in the early 1920's. Their present distant-water fleet is one of the most modern.

Products

Primary products of Faroese distant-water fisheries are salt fish and klipfish, which are exported to Brazil and southern Europe. Quantities of frozen fillets produced for the U. S. market are transported directly to Boston on specially equipped refrigeration vessels.

Principal Port

Main base is Faeringehavn in the Godthaab district. The port is open to all vessels. It provides all supplies, including fuel, food, and fishing gear. It has a small hospital, radio-telegraph center, a Faroese seaman's hotel, and a Norwegian welfare home.

This season, for the first time, Greenlanders will be permitted to land catches in Faeringehavn.

Fillet Factory

The Faeringehavn fillet factory produced 3,000 metric tons of cod fillets in 1967. Its capacity has been expanded. (Asst. Reg. Fisheries Attaché, U. S. Embassy, Copenhagen, July 5.)

Spain

THE FISH CANNING INDUSTRY

Spain's fish canning industry consists of 508 very small plants each producing an average of 175 to 2,000 metric tons a year. The canneries are spread among the provinces of Galicia, Guipuzcoa, Viscaya, Santander, Asturias, Lugo, Coruna, Pontevedra, Huelva, Cadiz, and the Canary Islands. The largest and best equipped are in Pontevedra Province, which has the greatest variety of raw fish, but the industry center is in Galicia.

Production Problems

National fish canning capacity is probably 220,500 tons a year, but only 33% is utilized. Production is low (1) because canneries are too small, (2) equipment is antiquated, (3) labor is unstable and costly, (4) high price of oil used in canning, (5) low priced tin for can manufacturing is insufficient, (6) varnish to coat inside of cans is expensive, (7) raw material supply is a problem, (8) production-line techniques required to satisfy demand for high quality pack are lacking, and (9) there are tariffs and other charges on Spanish products in international market.

Industry's Future

Badly needed is a program of mergers, closures of small inefficient plants, and upgrading of existing plants, equipment, and methods. Cold-storage plants to even out the flow of raw material are required; so too is an intensive program to market finished products. It will take a revolution in thinking by industry leaders to accomplish this. ("Informacion Conservera.")

Netherlands

FISH INSPECTION

Mandatory fish inspection is carried out by the Inspection Service for Consumer Articles through all stages of distribution. The program does not apply to Surinam and Netherlands Antilles.

Local & Export Fish Checked

The inspection program applies to both export and domestic fish trade. Canned and smoked fish are laboratory tested. Inspections take place at wholesalers, at retailers, at processing plants, and at fish auctions at the border in case of imports. After compulsory sale at the auction, the fish are no longer subject to inspection controls if transported by train, boat or truck. (U. S. Embassy, the Hague.)

Italy

REJECTS JAPANESE FROZEN TUNA

Some Japanese frozen tuna shipments to Italy have been rejected because of poor quality and improper size. Italian buyers claimed the tuna were not fresh, had freezer burns, and were not properly headed and gutted. They also complained that the fish were larger than the size contracted.

Increasing Rejections

Growing competition on the Italian canned tuna market and consequent demand for better-quality pack are causing increasing rejections. Italian processors claim that, after cooking, the tuna develops green or dark meat, sponginess, putty-like condition, and petroleum odor.

Prices Affected

Due partly to the Italian buyers' stringent delivery requirements, prices of Japanese frozen tuna exports to Italy have been rising. ("Katsuo-maguro Tsushin.")

Norway

HIGH-PROTEIN FISH MEAL PLANT IN OPERATION

A/S Norod, Egersund, Norway, started production of high-protein, low-fat fish meal, this year. The plant, equipped with West German machinery, uses a conventional gasoline extraction of fat. A gasoline explosion shortly after the opening of the plant disrupted operations until a few weeks ago.

Plant at ¾ Capacity

In August the plant was operating at three-quarters of its 15,000-ton annual capacity, but was expected to run at full capacity shortly. Fat extraction of fish meal (mackerel) produces protein and fat contents of 80.2% and 0.7%, respectively. Extraction based on fresh raw materials, however, promises an 84% protein content and only 0.2% fat content. (U. S. Embassy, Oslo, Aug. 6.)

* * *

MECHANICAL FEEDER STACKS SARDINES

Trio Maskinindustri in Stavanger, Norway, has developed a new type of mechanical feeder to stack sardines. Small pneumatic fingers can pack about 40 cans a minute. A vibrator turns all the fish heads in the same direction. The feeder is equipped with a double conveyor system, synchronized by an electropneumatic device, to assure uninterrupted delivery to the processing machinery.

U. S. Plant Using Feeder

A Trio feeder, combined with a head-cutter and nobbing machine, at a Maine (U. S.) cannery, has an 18,000 fish per hour capacity, equal to the production capacity of 4 or 5 human workers. Equipped with a belly-direction device, the feeder can be combined with filleting or packing machines.

Other Developments

Trio also has developed grading machines for brisling and sardines, and large herring and mackerel. One, grading fish by weight, can handle 18,000 fish an hour. (Export Council of Norway, Oct.)

* * *

PLANS MORE FACTORY TRAWLERS

Norway is expected to build more factory stern trawlers to satisfy the growing demand for kitchen-ready fish products. Norway has five such vessels. An additional factory stern trawler, now on order, will be the first to operate out of northern Norway. There is no difficulty crewing the new factory vessels, even though trips last several months. (U. S. Embassy, Copenhagen, Sept. 20.)

* * *

EQUIPS HERRING FACTORYSHIP

The 193-foot "Triplex," a converted trawler purchased in Holland, successfully completed sea trials during the summer and is now fishing. The vessel is equipped to purse seine herring and process them into fish meal. She carries freezing tanks for herring intended for human consumption and has 4 auxiliary engines to power the fishing and processing equipment. The vessel makes 12 knots. (U. S. Embassy, Copenhagen, Sept. 20.)

United Kingdom

LOBSTER FARMING TO BE TRIED IN SCOTLAND

A team of skin-divers has begun work on a lobster-farming project at Kinlochbervie and new lobster storage tanks have been opened at Grimsby.

Instead of traditional creels, the Kinlochbervie divers are laying large cages 6' sq. and 8' deep to provide cover for young lobsters while they grow to commercial size. Pulford Estates Ltd., developers of the white fish industry in northwest Sutherland, will market the catch.

Storage at Grimsby

The Grimsby storage tanks were built for Minch Shell-fish Ltd. with a grant and loans from the Highlands and Islands Development Board. The new tanks should make a big difference to lobstermen in the Outer Isles, as the company hopes to take crabs, scallops, eels, and winkles, as well as lobsters. Initially, 3 people will be employed on the project, but additional labor will be hired when crab trade develops. ("Fish Trades Gazette.")

Iceland

MID-YEAR FISHERIES REVIEW

The greatly reduced herring and capelin catch this year, uncertainty about northern herring stock migrations and doubts about the fall herring catch all point to a 1968 catch well below last year's reduced level. The decline in fishery exports during first-half 1968 may foreshadow lower foreign-exchange earnings for all of 1968.

By August 24, herring catch was 38,418 metric tons; it was 156,661 tons in 1967. Capelin catch 78,073 tons; 97,165 tons in 1967. Gains in white fish catch have been more than offset by herring decline.

The small herring catch has meant decreased herring meal and oil production. Loss of the Nigerian market for dried white fish has meant that most white fish raw material has been salted and the rest used for freezing and reduction.

Herring Production

Salted herring production, amounting to 35,000 barrels by June, had not even begun in mid-1967. Advance 1968 contracts for salted herring total 347,000 barrels. The USSR has ordered 100,000 barrels, to be salted in Sept.-Dec. this year: 40,000 to be delivered before end of year, and 60,000 during Jan.-Mar. 1969. Prices are based on last year's dollar prices and have been increased in terms of kronur to cover last November's devaluation.

Exports Drop

Poor catches caused a 30.8% decline in fishery exports in first half this year and, considering last year's kronur devaluation, a 26% decrease in value from US$45 million to $33 million. Fishery exports declined over 30% in value last year.

On September 7 the government agreed to finance 75% of the Price Equalization Fund to offset fluctuation in export prices. When prices decrease, frozen product exporters are reimbursed for the amount of the decline. Initially, the fund was financed 50-50 by government and industry. Under the new settlement, government will contribute 75% and industry 25%. Price guarantees are based on the export prices of Dec. 31, 1967. The government also agreed to provide 25 million kronur (US$1 57 kronur) in 1968 for payment to freezing plants in proportion to their outputs.

The quick-freezing industry's high domestic costs (costs and deficits in some cases were too great to benefit from last November's devaluation) and the importance of fishery exports made increased government assistance inevitable. (U. S. Embassy, Reykjavik, Sept. 12.)

LATIN AMERICA

Mexico

SURVEYS GULF OF CALIFORNIA

The Mexican Department of Fisheries has begun an intensive survey of Gulf of California fishery resources. It will be the most comprehensive survey of this area since the Japanese study made shortly before World War II.

As part of the Government's program to develop fisheries, the surveyors will measure both utilized resources and those with potential value.

Survey Areas

The first survey of the eastern shore will include the head of the Gulf and the western side as far as San Felipe. The survey will extend as far as Teacapan, Sinaloa, a few miles south of Mazatlan. Field work, begun in late August, will continue through September.

Survey Ships & Methods

A grid of trawl station lines has been laid out to cover the entire coastal area out to a depth of 20 fathoms. Eight shrimp trawlers donated by fishermen's cooperatives will make three 12-day trips each from Guaymas, Mazatlan, and intermediate ports. A biologist and a technician aboard each trawler will enumerate catches and evaluate results. Additional surveys out to 80 fathoms will be made by the large French trawler that recently conducted commercial fishing tests under a French-Mexican loan agreement.

Shrimp Studies

While the Gulf survey is underway, a related project is being carried on in the Gulf estuaries and lagoons. These areas are nursery grounds for young shrimp. Recent heavy increases in shrimp catches in Laguna Caimanero, near Mazatlan, have been attributed to construction of artificial drainage canals that provide clean fresh water. The current project is to study other bodies of water with similar physical improvement work in mind. (Regional Fisheries Attaché, U. S. Embassy, Mexico, Sept. 8.)

* * *

FISH CANNING IN BAJA CALIFORNIA

Baja California is the center of the Mexican fish-canning industry. The peninsula--State of Baja California and Territory of Baja California Sur--is an important producer of fresh and frozen lobsters, frozen abalone, totoaba, sea turtles, kelp, and other marine products. But canning and fish-meal manufacture are by far the most important parts of the industry.

Baja California State produces more marine products than any other state in Mexico; the port of Ensenada produces more than any other city. In 1966, the State produced as much as Mexico's entire Gulf and Caribbean coasts. Veracruz and Sinaloa, next highest-producing states, each produced less than half as much. Only Sonora and Sinaloa exceeded the State in value of production, while the Territory's catch value was sixth in Mexico. Shrimp, the principal fishery in Sonora and Sinaloa, have an extremely high unit value. In Baja, the largest fisheries are for species with a low unit price--sardines, mackerel, anchovies, kelp, and medium-price tuna. The fisheries for high-priced abalone and lobster are not large enough to bring Baja's total value up to first place.

Canning for Domestic Market

With two exceptions, all seafood canned in Baja California is produced for the domestic market. Canned tuna, sardines, anchovies, jack and Pacific mackerel, bonito, squid, mussels, and fish meal are sold entirely in Mexico. Baja produces nearly all the Mexican pack of abalone and tuna-scrap pet food.

Over half the abalone pack is exported to Asia and the U. S.; the U. S. imports all the pet food. Canned abalone is the second most valuable Mexican fishery export. In 1966, export value of canned and frozen abalone meat was US$2,573,000. Baja produced 5,235 metric tons of fish meal in 1966, over half the total Mexican production.

History of Industry

Commercial fishing in Baja California began about 1928, when the first canneries opened at El Sauzal near Ensenada, and at Cabo San Lucas at the southern tip of the

Mexico (Contd.):

peninsula. Prior to World War II, three more canneries opened at Ensenada, and 2 or 3 small abalone plants were built farther south. Development was steady, and the fisheries now are the peninsula's largest industry. There are 13 plants in Baja; one packs only tuna, 2 produce only abalone, several can only sardines, mackerel, and anchovies; and a few can 2 or more of these. Six operate fish-meal plants using cannery offal and some whole fish.

The canneries compare favorably with plants in the U. S., Canada, and Japan. Some older ones have antiquated equipment and rely on hand labor, while others have replaced obsolete machinery. The newer ones, outfitted with the latest equipment, shine with stainless steel. Sanitation standards are very high, retorting times conform to the rigid requirements of the State of California. Some new canneries have imported practices, techniques, and even technicians from well-known plants in Spain. The industry blends the best from Mexico, California, and Spain.

Ensenada Canneries

The government-controlled Bank for Development of Cooperatives (BANFOCO) has incorporated 5 of the canneries in Baja California.

The largest fish cannery in Mexico, Pesquera del Pacifico (BANFOCO), was built 6 miles northwest of Ensenada to take advantage of a small natural harbor. Since then, the little bay has silted, and Ensenada has built a modern harbor. The fishing fleet unloads at the dock in the city, and the fish are trucked to the cannery.

Pacifico is more than a fish cannery. It is really a food processing complex producing a great variety of canned products, seafoods, fruit, vegetables, fruit juices, tomato paste and puree, pet food, and fish meal. Originally, the plant only packed fish, then began processing tomato sauce in which to pack the fish, and eventually branched into fruit and vegetables. A reduction plant has been added to utilize the fish offal.

Pesquera Peninsular (BANFOCO) is the oldest cannery in Ensenada. Formerly at the water's edge, it is now some distance from shore due to a land fill formed when the modern harbor was built. The fishing boats unload at the dock, or into floating offshore hoppers connected to shore by submarine pipelines.

Peninsular specializes in packing sardines and anchovies in 4-oz. and 12-oz. rectangular cans. In late 1967, the plant began packing sea mussels gathered from rocks along the coast near Ensenada. Its fish-meal plant is equipped with a stick water plant for maximum utilization of cannery offal. Other Ensenada canneries give their fish offal to Peninsular; they find this more economical than operating individual plants to utilize small quantities.

The BANFOCO canneries are supplied by 2 company-owned purse seine fleets. The 3-vessel tuna fleet fishes as far south as Peruvian waters. The 6-vessel sardine and mackerel fleet fishes local waters. The larger refrigerated seiners go as far south as Isla de Cedros, taking bonito and yellowtail as well as sardines and mackerel.

Three canneries are partly owned and operated by Spanish interests.

Empacadora Galicia de Baja California and Empacadora Mar pack sardines and anchovies as Spanish-style sardines.

Conservas del Pacifico, S. A. (COPASA) is owned 55% by a Mexican food, wine and olive producer, and 45% by a consortium of 3 Spanish canning firms. It packs the greatest variety of seafoods of any one plant in Mexico.

COPASA owns and operates the newest and only Mexican-built purse seiner in the tuna and sardine fishery. "Copasa," an all-purpose, refrigerated vessel, fishes both tuna and sardines. When sardines are scarce in local waters, she fishes in the Gulf of California and lands catches at Guaymas. There the sardines are cleaned and headed for shipment to Ensenada by refrigerated truck.

Empaca Portena packs Spanish-style sardines, 1-lb. oval sardines, and mackerel in 1-lb. tall cans (salmon style).

The locally owned Empacadora Costa Azul cans abalone for export. For the domestic market, Costa Azul cans abalone, anchovies, and mackerel, and cooks and freezes lobster.

A fleet of privately owned small seiners provides anchovies, mackerel, sardines, and

Mexico (Contd.):

squid for the 7 Ensenada canneries. The fleet, about 25 boats 45-60 feet long, makes one-day trips, fishing in daylight. Their seines are ring nets, or modified purse seines without turntables. Catch sold for canning brings US$40 a ton. The canneries are extremely quality conscious. Any anchovies not suitable for canning are used in the meal and oil plants and bring only $16 a ton. High prices for tuna, sardines, and anchovies at Ensenada reflect high prices paid by nearby California canneries.

Southern Canneries

All canneries south of Ensenada are in extremely remote places. Their neighboring villages, from 1,000 to 1,500 people, depend almost entirely on the canneries, although there are lobster fisheries at 3 villages and one has considerable tourist business. Small company-owned refrigerated ships bring in perishables and carry out canned fish, fish meal, and frozen abalone meat. Coastal freighters also stop at some villages. All towns have airstrips for small aircraft required to haul out live lobsters. The towns are desolate, frontier-style, aggregations of shacks, but they are surrounded by a stark beauty of sea and desert that holds great attraction for visiting fishermen and yachtsmen.

One pioneer plant, Pesquera Isla de Cedros (BANFOCO), is on Cedros Island at the southern edge of Baja California State. It cans abalone and fish. Although at the southern edge of abundance of northern anchovy and mackerel, it is also at the northern limit of southern sardine, and draws seasonally from all these resources. Over 25 years ago, the cannery was described as "One of the cleanest I have ever seen." It still has a good reputation. A reduction plant uses cannery offal and whole fish.

Cedros is served by a company-owned fleet of 5 small purse seiners or ring net boats. As at other southern canneries, the abalone divers are members of the fishermen's cooperative associations that own the diving tenders.

Pesquera de Bahia Tortugas (BANFOCO), an abalone cannery in the northern part of Territory of Baja California Sur, is on the beautiful landlocked harbor of Bahia Tortolo at Puerto San Bartolome. To early American whalers, it was known as Turtle Bay, and visiting yachtsmen and fishermen still call it that.

Empacadora de Baja California, at Bahia Asuncion, is the only abalone cannery without an unloading wharf. The supply ship and diving boats lie off the beach and transfer cargo by amphibious "ducks." Visiting fishery experts have described it as "one of the best operated small fish canneries we have ever seen."

Years ago a small sardine cannery was built at San Juanico, but it never got into production. All traces of the village have disappeared and only the abandoned cannery building stands as a reminder.

Bahia de la Magdelena, one of the world's largest landlocked harbors, supports two canneries. Though lying south of the northern anchovy abundance, they still can draw on what remains of the southern race of Pacific sardine. Thread herring and Pacific mackerel are canned as "sardines" and are used, with anchoveta and round herring, for fish meal.

Pesquera Matancita (BANFOCO) is near the northern entrance to Bahia Magdelena. Like other canneries in the south, it is a self-contained entity with power plant, water supply, air strip, company stores, etc. Unlike the others, it can receive some supplies overland via a barely passable road. Two complete fish-meal plants and two canning lines can handle 170 tons of raw material a day. Matancitas is supplied by 3 small purse seiners.

The other Bahia Magdelena plant, on Isla Margarita a little to the south, is probably the world's smallest combination sardine cannery and reduction plant. La Maritima, at Puerto Alcatraz, has a daily capacity of only 20 tons of raw material, which is supplied by 3 very small seiners.

Half Mexican Tuna Pack

Over half the Mexican tuna pack is canned at Compania de Productos Marinos at Cabo San Lucas. The cannery, at the extreme southern tip of Baja, has operated continuously since about 1929. This was achieved despite changes in ownership, damage from tropical storms, and a change in marketing

Mexico (Contd.):

from export to domestic in response to growing Mexican demand. Marinos has enough cold storage room for 200 to 250 tons of frozen tuna, but other equipment is somewhat outmoded; the plant depends on hand labor. Skipjack and yellowfin are packed as first-line tuna; bonito and yellowtail are labelled economy. Scrap is used for fish meal in the reduction plant.

Marinos' 4-vessel tuna fleet includes 2 veteran pole-and-line live bait boats that have fished out of Cabo San Lucas for years. A third boat, the largest tuna vessel in Mexico, can carry 310 tons of frozen tuna. The fourth is owned by an Ensenada fishermen's cooperative.

Several better-known tuna fishing banks are closer to Cabo San Lucas than to Ensenada, and Marinos has a larger canning capacity than Pesquera del Pacific, Ensenada. So they have worked out an informal arrangement allowing Ensenada vessels to sell catch at San Lucas when Pacifico cannot handle the fish--or when an Ensenada vessel must put into port with a catch too small to make a trip home worthwhile.

Conservas de California is a vegetable cannery in La Paz on the Gulf of California. It specializes in canned chilis and olives, but occasionally it packs small quantities of specialty sea foods.

Can Factories

Can factories in Ensenada and Monterrey provide standard-size cans for all Baja California canneries. Odd sizes and shapes, not available from Mexican can makers, are imported from the U. S. Canned fish may be shipped into Mexico from the Free Zone of Baja California duty-free, even when imported cans are used.

Practically all canneries use their own labels and brand names and also pack under other labels for distributors. The 2 principal tuna canners share some brand names and pack for one another when orders get ahead of production.

The huge growth of the fish-canning industry has come from the tremendous expansion of consumer demand during Mexico's economic development. Imported canned fish has always been in great demand among higher income groups, and a bewildering variety of products is still imported from Europe, North America and Asia. As potential consumers increased, domestic canners took advantage of the growing market and began packing competitive products that are acknowledged copies of well-known imported favorites. There is a proliferation of Spanish- and Portuguese-style sardines, squid, mussels, U.S.-style tuna, and salmon-style mackerel (there are no salmon in Mexico). Many labels even show the names of foreign companies that provided techniques and technical supervision.

Peru

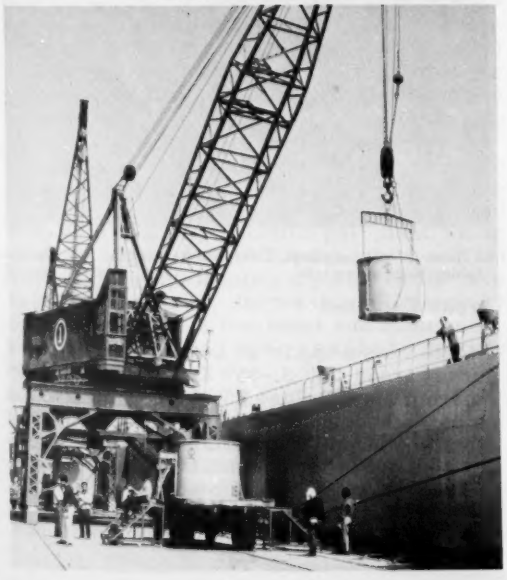
FIRST PERUVIAN BULK SHIPMENTS OF FISH MEAL

The first bulk shipments of fish meal from Peru apparently were a complete success. In 8 working days (between June 24-July 4), 15,197 metric tons of bulk fish meal were loaded aboard a tanker, an operation normally requiring 13 days with the same quantity of sacked meal. The operation was repeated in August.

The bulk meal requires only 57 cubic feet per ton, compared with 80 cubic feet per ton for sacked meal. Proponents of the new system claim up to $10 per ton may be saved by shipping in bulk.

The experimental loading was carried out in Chimbote. Meal was dumped from sacks by hand and transferred via small conveyers into large canisters carried aboard trucks. (The cannisters were 6 feet high by 5 feet 11 inches in diameter, and hold $2\frac{1}{2}$ tons of meal; each required 4 minutes to fill. Each truck carried 2 or 3.) The cannisters were trucked to dockside, lifted individually by crane, and the meal emptied into the hold of the tanker. The first operation employed 70 cannisters, 3 cranes (with another held in reserve), 35 trucks, and about one-third the personnel required in the normal sacked-meal loading operation. The record operation employed 40 trucks and 90 cannisters. All the meal was treated with a liquid antioxydant (Etroxiquina) and was subject to the requirements of the vessel owner and underwriters: cured for 21 days, treated with a minimum of 100 grams of

Peru (Contd.):



Photos: "Pesca."

antioxygant per ton, fat content of the meal at time of shipment no more than 12 percent, and with temperature, moisture content, etc., similar to normal meal. During shipment, the holds were sealed and filled with inert gas, and the oxygen level kept below 2 percent.

The experimental shipments were undertaken by 7 firms, all members of the Peruvian Fisheries Consortium. The meal was loaded aboard the Dutch vessel "Thuredrecht" bound for Rotterdam. The vessel made the trip in 20 days, unloaded its cargo in 1 day, and returned immediately to Peru. Another shipment was made August 20. Engineers plan to reduce loading time to 6 days by using larger cannisters (7 feet high, 6 feet in diameter, and holding $3\frac{1}{2}$ tons of meal) and reducing to 55 cubic feet the area required for a ton of meal. Another shipment was scheduled for October 17. ("Pesca," July 1968.)

* * *

JAPANESE FIRM TO INVEST IN FISH PRODUCTION

Taiyo Fishery Co., one of Japan's leading fishery firms, is planning to buy all the shares of Industriad Del Mar (INMAR); the Japanese company already owns 50%. Taiyo believes that a wholly owned subsidiary will be profitable because fish meal export prices have stabilized and the anchovy catch has increased. The company also intends to buy 2 fish meal plants to expand its business in Peru.

Fish Meal Plants

The INMAR fish meal plant at Atico, close to the Chilean border, is too far from the

Peru (Contd.):

fishing grounds to operate efficiently. Taiyo wants to acquire plants at Chimbote, in northern Peru, and at Callao and Pisco, in central Peru, to even out operations. Two companies will be selected from about 10 local firms.

To Increase Production

Taiyo, hoping to have INMAR operate about 30 fishing boats, expects to increase fish meal production to 100,000 metric tons annually--about 3 times present capacity. The Japanese company also plans to include shrimp, tuna, and sea bream in INMAR's operations. ("Japan Economic Journal," Oct. 8.)

Nicaragua

PRODUCTION AND EXPORTS

During the first 6 months of 1968, the Nicaraguan fishing industry produced nearly 3.5 million pounds of fishery products--mostly shrimp and lobster--worth over $3 million. Nearly all the shrimp was exported, primarily to the U. S. Between 71 and 81 shrimp vessels and 45 to 53 lobster boats operated during the period.

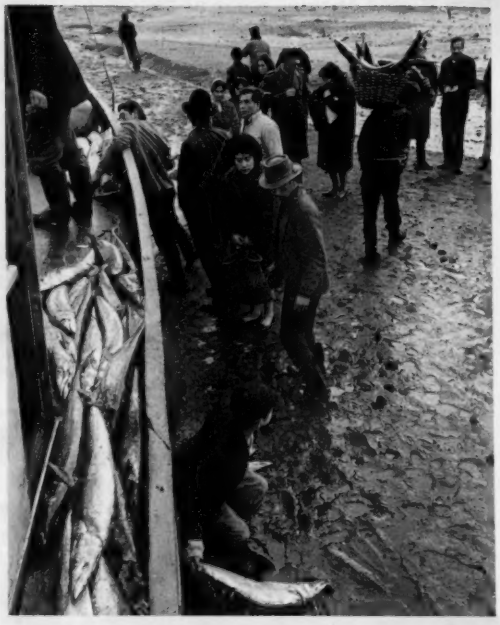
Jan.-June Production and Export Totals		
	Production	Exports
	. . . . (1,000 Lbs.) . . .	
Shrimp, frozen. . .	2,758.8	2,831.3
" dried . . .	521.6	65.3
Lobster, spiny. . .	147.2	155.5

(Instituto de Fomento Nacional, "Boletin Information Pesquero No. 8.")

Chile

JAPAN EXPLORES FOR TUNA OFF CHILE

The Japanese Fisheries Agency has released the first interim report on the tuna long-line explorations by the research vessel "No. 31 Azuma Maru" (340 tons) in the upper latitudes off the coast of Chile.



At Puerto Montt, southern Chile, customers buy directly from fishing boats at low tide. (FAO/S. Larrain)

Areas Explored

The vessel made 24 sets in the first of 4 survey areas, 20° S.-35° S. and 100° N.-130° N., from May 23-June 25. The 31 metric ton catch--albacore 14 tons, bigeyed 8 tons and others--did not include black tuna. The vessel operated in the second area, 20° S.-35° S. and 70° W.-100° W., from July 4-Sept. 21. ("Suisancho Nippo," July 9.)

ASIA

Japan

STUDIES MERGER OF TUNA PACKERS

The Tuna Packers Association has published an interim report proposing packing plant mergers and industry modernization. The 139 plants owned by 112 firms would be reduced to 43 initially and to 14 through later mergers.

Industry Difficulties

Independent tuna packers are having trouble with raw material and labor problems, increasing competition in foreign markets, and weakening competitiveness of the Japanese product. As South Korea and Taiwan are likely to begin tuna packing, Japan must strengthen her international competitiveness. The industry must accelerate modernization by streamlining production processes and consolidating operations.

Initial Merger Plans

Mergers would increase production by combining and mechanizing operations. In the U. S., 20 packing firms produce 20 million cases of canned tuna a year. The top seven pack 19.3 million cases, or about 2.8 million per firm. In Japan, 112 packers produce 6 million cases a year at 139 plants, or about 43,200 per plant. Assuming that 500 cases per day is the minimum output for economic plant operation, to pack 6 million cases the 112 packers could operate only 107 days a year. However, if machine-packing is adopted, minimum daily production would have to increase to 700 cases, plants would have to operate 200 days a year and minimum annual production per plant would thus be 140,000 cases. To pack only 6 million cases a year, the number of plants would have to be reduced to 43. Increasing efficiency by using more packing machines and other modern equipment will necessitate further mergers.

Later Mergers

A second merger would reduce the number of plants to 31, producing 1,000 cases a day per plant and increasing overall annual production to 6.2 million cases. The fifth merger would cut plants to 14, each packing a minimum of 500,000 cases a year, for a total annual production of 6.8 million cases.

Proposed Programs

Cooperatives would be established for each group of packers. Means must be found, under existing law, to extend loans to the cooperatives and to assist packers who want to retire or transfer to other industries. Two different programs have been proposed to implement the mergers. One would set up a US$0.5-1 million subsidy program to assist packers withdrawing from the industry. It would be financed either half by the Government or wholly by the industry, 50-50 between packers and can manufacturers. The other program would set up a Government-financed purchasing agency to buy lots, plants, and business licenses from retiring owners. Land and facilities would be sold to parties other than tuna packers and the business licenses sold only to packers. No new license would be issued, restrictions would be imposed on "outsiders" (packers not belonging to the Association), and fixed performance quotas established. ("Suisan Tsushin," Sept. 13.)

* * *

DISBANDS TUNA PROMOTION ORGANIZATION

The Japanese International Tuna Association, formed in 1956 to promote frozen and canned tuna exports to the U. S., is to be dissolved. The Association has been promoting tuna exports with funds provided by a 50% government subsidy, matched by contributions of 25% each from the frozen tuna producers and the canned tuna packers. However, frozen tuna producers, faced with growing production and export problems, have questioned the need for such a program, and their resistance has led to the decision to end the program. Future export promotions will be undertaken by the Japan External Trade Organization (JETRO), with government subsidy. ("Nihon Suisan Shimbun.")

* * *

Japan (Contd.):

TUNA PRICE
STABILIZATION CONSIDERED

The Federation of Japan Tuna Fisheries Cooperative Associations (NIKKATSUREN) is studying measures to stabilize tuna prices, primarily yellowfin, which have dropped more than usual. NIKKATSUREN wants to build its own cold storages to regulate domestic tuna supply and so stabilize prices. In the export market, Japan alone cannot stabilize prices; she must seek the cooperation of South Korea and Taiwan.

Demand High Quality

Study of the domestic market indicates that demand for high-quality fresh tuna will grow. Consumption of medium- to high-grade fish is increasing in rural communities; since medium-quality tuna is abundant, market demand for it must be stimulated. Promotion of fresh-fish consumption is important because tuna bring higher prices on fresh market (for "sashimi" and "sushi" trade) than when sold to packers. However, consideration also must be given to stabilization of supply to the packers, who annually use over 100,000 metric tons of raw tuna. They are faced with shortage of raw material.

Adjust Tuna Supply

To adjust tuna supply on domestic market, NIKKATSUREN would have 5,000- to 10,000-ton capacity cold storages at Yaizu, Shimizu, and Misaki. Yellowfin landings would be stored during May, June, and July, when prices decline; they would be released after September, when prices begin going up. Normally, yellowfin prices decline during those months from around US$529 a short ton to $403-454 a ton exvessel, but this year prices fell to $333-365 a ton.

As for storage methods under the supply adjustment plan, NIKKATSUREN either could buy the tuna landings, or store them for sale on a consignment basis. Since cold storages would have to be operated year-round, they also could be used seasonally to store albacore, skipjack, and bait saury.

Export Market

S. Korea and Taiwan have begun turning to the Japanese market because of price declines in other markets. Taiwanese fishermen are taking many bluefin tuna in the Indian Ocean. They want to sell them to Japan because there is no market in Europe or the United States and Taiwanese demand is very limited.

Some Japanese feel tuna imports should be handled through one agency and conform with NIKKATSUREN's price-stabilization program. However, many fear that imports of foreign-caught tuna would amount to supporting foreign fleet expansion. They want the countries seeking markets in Japan--South Korea and Taiwan--to agree to stop enlarging their fleets. Under present circumstances, this is questionable. ("Suisan Keizai Shimbun," Sept. 18 & 19.)

* * *

TUNA PACKERS HAMPERED
BY SHORTAGES

Packers in Yaizu and Shimizu pack close to 80% of all of Japan's canned tuna. They are being hampered by a raw fish shortage, caused by poor landings of summer albacore and a slow fall season skipjack fishery. Normally, when fruit packing ends in early September, packers switch to full-time tuna canning. Short supplies of albacore and skipjack are making it hard for them to keep going until tangerine packing start in November.

Possible Plant Closures

Some packers feel they should suspend production rather than lose money keeping plants open. However, if they stop, they have to pay their workers over 60% holiday pay to keep them for the next fruit-packing season. Besides, production stoppage would delay fund turnover and adversely affect the plant's financial position. ("Suisan Keizai Shimbun," Sept. 6.)

* * *

ATLANTIC ALBACORE
SHIPPED HOME

The extremely poor summer albacore fishery off Japan and a domestic raw material shortage have caused some Japanese firms to ship albacore taken off Angola back to Japan. Some firms preferred to ship catches home rather than sell to other countries, because the small (about 13 kilograms or 28.6 pounds)

Japan (Contd.):

and fair quality fish either were rejected or brought very poor prices on the export market. Japanese packers, paying $428-454 a short ton, claimed the Angola-caught albacore yield was low, only about 50% recoverable for brine-packed tuna production.

The fishery off Angola was still good in August despite the passing of the peak fishing season. Vessels were catching around 3 tons per operation. ("Katsuo-maguro Tsushin," Aug. 1.)

* * *

AVERAGE PRICES OF FROZEN TUNA EXPORTS TO U.S., JUNE-SEPT. 1968 & 1967

Species	Prod.	Export Prices Average				Quantity Exported
		June	July	Aug.	Sept.	in Sept.
		. . .	(US$/Short Ton, f.o.b. Japan) . . .			Short Ton
Albacore	Rnd.	450 (424)	453 (462)	456 (472)	451 (472)	92 (835)
Yellowfin	gill. & gutt.	364 (352)	1/ (400)	366 (397)	371 (409)	3,836 (2,042)
Albacore	loin	1/ 920 (892)	933 (913)	991 (948)	1,008 1/ (990)	75 (150)
Yellowfin	loin	805 (797)	807 (863)	811 (897)	848 (890)	106 (28)

Note: Prices in brackets are for same months in 1967.
1/Only one shipment in month.
Source: Fisheries Attaché, U. S. Embassy, Tokyo, Oct., from Japan Frozen Tuna Exporters' Assoc.

* * *

BERING SEA GROUNDFISH CATCH UP

Twelve mothership-type bottom trawl fleets in the Bering Sea had taken 505,000 metric tons of fish by July 25, about 20,000 tons more than in 1967. The high catch was due entirely to the large amount of Alaska pollock taken by 5 meal and minced meat factoryship fleets. Catches of most other species were sharply below last year's. Pacific ocean perch landings of 3,000 tons were 13% of 1967's catch and the 7,000-ton herring landings were less than one-third. Herring catch was low because there were no good concentrations of egg-bearing fish off Cape Olyutorski. In early August the four herring fleets in that area began fishing tanner crab. ("Nihon Suisan Shimbun," Aug. 7.)

* * *

1967 FISHERY CATCH HIT HIGH

Data from the Japanese Agriculture and Forestry Ministry indicate that 1967 fishery production was a record 7,824,000 metric tons (excluding whales). This was 10 percent, or 722,000 tons, more than 1966 landings of 7,103,000 metric tons. (On April 12, 1968, the Ministry had released preliminary data showing 1967 fishery production about 7.7 million metric tons.)

Marine fisheries accounted for 7.24 million tons of the total, 10 percent more than 1966's 6.56 million tons. ("Suisan Tsushin.")

* * *

IMPLEMENTS KENNEDY ROUND TARIFF CUTS

On July 1, Japan effected a simultaneous tariff reduction on imports. Under the Kennedy Round, Japan agreed to a two-fifths cut on items listed for a 50% reduction over a 5-year period. Frozen tuna and salmon, and canned fish are among fishery products affected by the reduction. Initial cuts on fishery products will reduce the 10% duty on frozen fish imports to 8% and the 20% duty on canned fish to 15%. Fisheries Agency officials and industry leaders foresee no serious adverse effect on the domestic industry. Some observers feel that the reduced levy may serve to stimulate rising frozen tuna imports. ("Nihon Suisan Shimbun.")

* * *

SHRIMP IMPORTERS ADOPT STANDARD PURCHASE CONTRACT

The Marine Products Importers Association adopted a standard contract for use in purchasing shrimp from foreign countries (excluding Mexico). The contract will protect Japanese trading firms against heavy losses when shipments contain uneven-sized shrimp or weight shortages. Such cases have occurred frequently in deliveries from southeast Asian countries this year. Claims of contract violations are difficult to settle under present procedures, since the buyer, by means of letter of credit, makes full payment at the time of purchase. The new contract, while not stipulating any definite amount payable by letter of credit (the Association plans to negotiate for an 80-percent L/C payment), does

Japan (Contd.):

provide for final inspection of shipment at the port of destination instead of accepting delivery on "f.o.b. final" conditions.

Mexican Imports

Imports from Mexico will be regulated voluntarily to avoid oversupply. Trading firms importing shrimp from Mexico will notify the Association of the quantity loaded on vessels. When the quantity reaches a certain level, the Association will advise importers not to order any more shipments during that month. Claims against Mexican shrimp will be handled jointly by the trading firms. ("Suisan Tsushin," Sept. 20.)

* * *

EXPECTS TO IMPORT 4,000 TONS SALMON ROE

Salmon roe imports from Alaska and Canada began in July, but by August 15 total imports were only 130 metric tons.

Production

The pink salmon season peaked in mid-August in all parts of Alaska (Bristol Bay, Cook Inlet, Prince William Sound, and Ketchikan), but the ratio of males was higher than expected and salmon roe production was low. Nevertheless, combined Alaskan and Canadian salmon roe production was expected to reach 4,000 tons.

Prices

Red salmon roe prices started about 7 cents a pound below the first price last year. No appreciable price fluctuation has been noted since. Demand was high at mid-August and there was a shortage of salmon roe produced by factoryship. Prices were expected to remain stable until the season's peak in September and October. There will be a carryover to next year if production does reach 4,000 tons.

Mid-August shore prices per pound were: chum salmon roe: first grade US$2.60; second grade $2.50; third grade $2.40. Red salmon roe: first grade $2.40; second grade $2.30; third grade $2.00. Silver salmon roe: second grade $2.00; third grade $1.80. ("Suisan Tsushin," Aug. 17.)

* * *

IMPORTS MINCED FISH FROM TAIWAN

Edible fish cake processors in southwestern Japan, faced with an acute shortage of raw material, are planning to import "surimi" (minced fish meat) from Taiwan. Recently survey teams sent to Taiwan found an abundance of lizardfish and croaker, suitable for "surimi." The processors will provide technical assistance for production of fresh, high-quality material. ("Suisan Keizai Shimbun.")

* * *

IMPORTS SOVIET FISH MEAL

Five major trading firms have imported about 4,000 metric tons of white fish meal from the USSR. This was Japan's first purchase of Soviet fish meal this year. In 1967, a shipment of Soviet meal could not clear Japanese Customs and was exported to another country.

Prices

Import price was about US$172-175 a metric ton, Yokohama warehouse delivery, about $11.00-14.00 lower than the Japanese factoryship meal price. ("Minato Shimbun," Aug. 22.)

* * *

SWORDFISH EXPORT PRICES AT RECORD HIGH

Export prices for swordfish shipments to the U. S. reached a record high in July. Prices for swordfish fillets (50-70 pound size) in July-Aug. were around 55 cents per pound c. & f., about 20 U. S. cents above comparable 1967 prices which averaged 34.2-35.2 U. S. cents. This sharp gain is attributed to poor swordfish landings in the U. S. Low production in Canada and Peru, the two other major swordfish suppliers, also contributed to the price rise. Prices per pound for swordfish exports to the U. S. during first half 1968, for 50-70 pound size fillets c. & f., rose from 39.7 cents in January to 47.6 cents in June. ("Suisan Keizai Shimbun," Aug. 13.)

* * *

WHALE OIL PRICES DOWN

Estimated fin whale oil production for the current North Pacific whaling season is about 15,500 metric tons. Contract price of about

Japan (Contd.):

US$130 a metric ton is about $10 below the price for fin whale oil produced in the Antarctic whaling season. Whaling companies have made concessions because the total production will be sold on the domestic market. Producers are satisfied despite the low contract price because the overseas market for soybean oil, fish oil, and fin whale oil is extremely slack.

Down $30 A Ton

Sperm whale oil production for the current North Pacific whaling season is estimated at 20,000 tons. Prices are expected to be about $142 a ton, compared to last season's $172. Nearly all the sperm whale oil production will be sold to domestic users.

* * *

OYSTER CANNERS CUT PACK

The canned oyster pack this year will be reduced 35% from last year, to 1.25-1.30 million cases. Despite such a marked reduction, many canners have large inventories totaling 200,000-250,000 unsold cases.

Large Inventory

The large stocks have accumulated due to an inactive export market, and uncertainty in purchases because of canned oyster production in the Gulf area of the U. S. Financial help is needed to prevent canners from selling at low prices, causing chaos in the market. Hiroshima canners had planned to extend some financial help to cover unsold stocks, but the help had not materialized by mid-July.

The market is expected to improve this fall and winter. ("Suisan Tsushin, July 12.)

* * *

FREEZES SEA URCHIN EGGS SUCCESSFULLY

A simple method of freezing sea urchin eggs has been perfected by the Iwate Prefectural Fisheries Laboratory. Sea urchin eggs, a delicacy in Japan, are served raw at high-class "sushi" restaurants. "Sushi" is raw sliced fish served on rice. Chemical preservatives, ordinarily used to retain freshness, produce an off-flavor after extended storage. In new freezing technique, fresh eggs are soaked in brine for about 10-15 minutes and then are quick-frozen. This may open a new field in sea urchin egg processing. ("Minato Shimbun," Sept. 17.)

* * *

AGAIN SEEKS PROTECTION FROM GEAR THEFTS OFF MEXICO

The Federation of Japan Tuna Fisheries Cooperative Associations (NIKKATSUREN) has again asked the Japanese Fisheries Agency to send a "guidance" vessel to the waters off Mexico to protect Japanese vessels against continued gear thefts. During April to July, 13 cases of gear thefts, amounting to over US$10,000 in losses, were reported by Japanese long-liners fishing off Mexico. NIKKATSUREN fears that continued occurrence of such interferences could lead to conflict on the high seas. This problem, however, is presenting considerable difficulties to the Agency since it cannot file protests without knowing the nationality of the offending vessels, and sending of a "guidance" vessel to such distant waters would entail much expense. ("Katsuo-maguro Tsushin," Aug. 6.)

* * *

CANNED MACKEREL MARKET IN U. S. SURVEYED

The Japan External Trade Organization (JETRO) has reported the results of the canned mackerel and saury marketing survey conducted in the U. S. The survey revealed that in Atlanta, Georgia, Negro housewives were the principal consumers of canned "wet fish," and market demand will continue at present level.

Hopeful About U. S. Market

The Japanese hope the U. S. market, which only recently began importing canned mackerel in quantity, will provide a good outlet for the Japanese product. Between December 1966 and early 1967, the U. S. imported from Japan 200,000 cases of canned jack mackerel and 445,000 cases of canned Pacific mackerel.

Japan (Contd.):

Atlanta Survey

In Atlanta, canned jack mackerel were the most widely used canned "wet fish." Interviews with Negro householders showed that 91-93 percent of the respondents in all income categories used canned jack mackerel, while only 4-13 percent reported buying canned Pacific mackerel. The market for canned saury was very limited. Between 90-94 percent of the Negro housewives of all age groups reported using canned jack mackerel. Among the white population, only 16 out of 100 respondents said they used canned mackerel. Among the canned "wet fish," jack mackerel was the most popular because of its lower price (according to 97 percent of the respondents).

Served in Several Ways

Housewives said they served canned fish in fish loaf, salad, and sandwich, in that order. Canned tuna was by far the leading choice, followed by canned salmon. Retail stores surveyed showed that most of the retailers in Philadelphia and Atlanta handled canned jack mackerel, while only a few chain stores carried canned Pacific mackerel. The canned saury market was extremely limited. As for the country of origin of canned mackerel marketed in Philadelphia and Atlanta, 7 out of 13 chain stores said they sold only U. S. domestic products, while 4 reported handling imports from Japan and 2 said they carried South African products. ("Nihon Suisan Shimbun.")

日本

Malaysia

SARAWAK'S FISH IMPORTS DRAIN FOREIGN CURRENCY

In 1967 Sarawak imported about US$670,000 worth of salted, dried, and boiled fish; about $180,000 worth of fresh-frozen or refrigerated fish; and almost $670,000 worth of canned fish. Fish must be imported to meet Sarawak's needs from October through January when local fishing comes to a halt. This off-season, known as "Landas," causes the State an annual loss of over $1.5 million in foreign currency.

Lack of Local Facilities

Sarawak lacks fish-freezing and refrigerated-storage facilities and has no efficient marketing organization to help solve the currency drain problem. Furthermore, there are no large fishing vessels above 100 tons capable of fishing during "Landas."

Inshore Trawling Opposed

Fearing depletion of stocks, local fishermen are opposed to trawling inside the 30-fathom limit. The Marine Fisheries Department is considering new regulations limiting trawl depth and net mesh size. The Department wants trawling to continue so that the fishing industry can become self-supporting. Eight trawling licenses were issued in 1967 but foreign companies' requests to trawl in Sarawak waters were rejected because of local opposition. (U. S. Consulate, Kuching.)

* * *

UNDP FISHERIES TRAINING CENTER

The Malaysian Government has asked the United Nations Development Program (UNDP) for assistance in establishing a fisheries training center at Penang. The UNDP will contribute US$1,336,700; the Malaysian Government $1,441,000. The Food and Agriculture Organization (FAO) will administer the 5-year project.

Training Program

The present fishing industry, confined almost entirely to shallow inshore waters, operates with small, rather primitive vessels and old-fashioned gear. Introduction of more sophisticated equipment and vessels, for expansion into offshore waters, will require training of crews and technicians. Crews and technicians will receive training in navigation, fishing, and operating vessel engines. Three different courses will be given--short courses for existing crews in operation of sophisticated vessels and gear; longer courses for new crews; and courses on modern shrimp fishing for trainees from Sabah and Sarawak. An international training team will include a project manager, a chief instructor, 2 master fishermen, a fishing gear expert, an electronics specialist, and consultants. UNDP will provide expert services, fellowships, a training vessel, fishing gear, vehicles, and equipment for shore training.

Malaysia (Contd.):

Upon termination of UNDP support, the Malaysian Government will operate the center.

Changes in Fishery Industry

Introduction of improved fishing gear and mechanization of fishing vessels is changing Malaysia's fishing industry rapidly. Vessels with inboard engines increased from 1,500 in 1957 to 9,300 in 1966. During the same period, annual fish catches in West Malaysia increased from 111,000 metric tons to 234,000. The profitable centralized trawl fishing is expanding. In East Malaysia, foreign companies and local enterprises are participating in the expanding shrimp fishery.

Conflict With SE Asia Center

The UNDP project may conflict with the Southeast Asian Fisheries Development Center, approved by the Manila Conference on Southeast Asian Agricultural Development in April 1967. That Center, composed of an oceanic fishery training division in Bangkok and an oceanic fishery research division in Singapore, was to train fisheries technicians of the Southeast Asian countries, to develop fishing grounds and to investigate fishery resources of Southeast Asia. The original agreement, drafted by Japan, called for a flat assessment of member countries. This was rejected with Malaysia's initiative. A revised agreement recommended voluntary contributions of unspecified amounts. Establishment of the UNDP supported Fisheries Training Center may induce Malaysia to withhold financial support from the Manila project. If other members follow such a policy, the Southeast Asia Center would collapse.

South Vietnam

CONSTRUCTS FISHERY PROJECTS WITH U. S. AID

The Agency for International Development (AID) will contribute over US$42,000 to a joint project to rebuild La-Gi harbor in Binh Tuy province. Availability of a usable harbor should increase the local fish catch considerably.

Builds Saigon Wholesale Fish Market

Construction of the U. S. financed Saigon wholesale fish market began in June. The project, consisting of a wharf, a wholesale fish market, and a cold-storage plant should be completed by the end of the year. (AID Saigon.)

North Vietnam

USSR AIDS FISHERIES

The research vessel "Onda" of the Pacific Institute for Fisheries and Oceanography (TINRO) returned to Vladivostok in June after an 18-month cruise to North Vietnam where Soviet specialists trained fishermen, helped organize shore processing plants, and advised on marine fisheries development.

Soviets have intermittently provided fisheries aid to North Vietnam since the early 1960s. They have joined the North Vietnamese in fisheries research in the Gulf of Tonkin. Most of this joint research effort has been conducted by TINRO scientists.

Cooperative fisheries research was initially sponsored by the West Pacific Fisheries Commission which included, in addition to North Vietnam, North Korea, Communist China, and Mongolia. After the Chinese withdrew from the Commission in 1966, the USSR continued aid to North Vietnam and North Korea on a bilateral basis.

Gulf of Tonkin Survey

A comprehensive survey of fishery resources in the Gulf of Tonkin was carried out in 1959-1960 by 3 TINRO vessels: "Onda," "Pelamida," and "Orlik." Similar research continued in subsequent years.

In late 1965, under a Technical Assistance Program, the USSR supplied Hanoi with 3 medium freezer trawlers ("Maiak" class of about 800 gross tons). These vessels can stay at sea for 50 days and have a 200-metric-ton fish hold capacity.

Pakistan

FISHING INDUSTRY PROGRESSES

The income of West Pakistan fishermen has increased appreciably in the past decade with government, U. N., and U. S. assistance. The 9-year-old fish harbor and market at Karachi has affected the lives of fishermen and their families. The fishermen are mechanizing their boats, getting better gear and equipment--and making larger catches. Still, only a minority of the more than 5,000 fishing boats along the W. Pakistan coast has been mechanized.

Fishermen's Cooperative Builds

A fishermen's cooperative has built and equipped a hospital, schools in some villages, and provided fresh, pure water. Helping in these developments were the U. S. with money and equipment, and FAO with plans for the harbor and market.

Facilities at the fish market include stores for nets, gear, equipment spares, oil and petrol. These supplies are available cheaply at easy terms by the fishermen's cooperative society.

Fig. 1 - Fishermen strain Karachi surf for small fish and crabs. Karachi harbor is to the right; to the left is a small island, near which masts of a sunken ship indicate shoals. (FAO/W. Williams)

Fig. 2 - Typical net-repairing scene on the jetty. (FAO/J. Olsen)

Fig. 3 - Dried fish for auction. Both fresh and dried fish of all kinds and crustaceans are auctioned. (FAO/J. Olsen)

Pakistan (Contd.):

Fig. 4 - Fresh fish from the Arabian Sea are brought to this busy Karachi market every day. (FAO/W. Williams)

Fig. 6 - Boy selling "Kachra" at fishing village 11 miles from Karachi. (FAO/W. Williams)

Fig. 5 - Fish-drying yard in Karachi.

SOUTH PACIFIC

Australia

TASMANIA HAS GOOD FISHERY POTENTIAL

Interest abroad is growing in the fishery potential of areas adjacent to Australia's Tasmanian territorial waters. There have been reports of substantial concentrations of fishery resources that indicate a good future for joint ventures by foreign and Australian businessmen.

From small beginnings a few years ago, abalone fishing has developed into an important export industry. It is second in importance among all Tasmania fishery products only to the spiny lobster. Industry growth was (weight in lbs. of meat):

	1966	1965	1964
Quantity	970,000	403,400	103,200
Value	A$350,000	A$101,000	A$25,700

More substnatial growth is expected in the near future.

Companies Active

Safcol (Tas.) Pty. Ltd. and Planet Fisheries (Tas.) Pty. Ltd. are processing abalone in Tasmania. A factory at Margate, operated by Gourmet Sea Foods, is producing tenderized abalone steaks mainly for export to the U. S. and the Orient. W. Angliss and Co. (Aust.) Pty. Ltd. plans to expand all over Tasmania in fish processing. This project is expected to take up to 10 years and cost over $3,000,000. (U. S. Consul, Melbourne.)

Note: A$1 = US$1.12.

* * *

SOVIET SHRIMP FISHING IN GULF OF CARPENTARIA CREATES UPROAR

The Soviet stern trawler "Van Gogh" fishing shrimp in the Gulf of Carpentaria has caused an uproar in Australia. Australian fishermen claim that Van Gogh wailed her sirens at them as soon as sizable shrimp stocks were spotted, forcing them to scatter to prevent collision with the giant Soviet vessel. This harassment is blamed for having deprived the Australians of $24,000 worth of shrimp in one sweep. Some fishermen "took a couple of shots at the vessel with a carbine." Prime Minister Gorton ordered a Royal Australian Air Force plane to patrol the Gulf and dispatched an armed Navy patrol boat. The Government has protested to the Soviet ambassador in Canberra against alleged intimidation and harassment of Australian trawlers by the Van Gogh. Despite this, the Van Gogh rescued the crew of an Australian trawler sinking in the Gulf, and the Soviet captain threw a vodka party for them. ("The Washington Post," July 12 & 14; Radio Melbourne, July 11; UPI, July 13.)

Van Gogh

The Australian press reports the Van Gogh is trawling for shrimp in 8 fathoms 40 miles off Karumba on the southeast coast of the Gulf. She can catch and process 70 tons of shrimp in 24 hours. She has a fish meal plant to process offal and less valuable species and is believed to be the mothership of 10 smaller freezer trawlers. The vessel carries a crew of 103, including a number of scientists, 33 women, 2 physicians, a dentist, and a nurse. The Van Gogh is apparently surveying shrimp resources and may be exploring for other species since she carries nets with mesh sizes too large to catch shrimp. (U. S. Consulate, Brisbane, July 2; "Brisbane Courier Mail," July 2 and 3; "The Telegraph," Brisbane, July 1.)

Industry Expansion

Australia has been preparing a major expansion of the shrimp industry into the Gulf of Carpentaria since 1963, when researchers found commercial stocks there. Schooling by sexually mature shrimp occurs in the Gulf from March to September; the schools provide the commercial catch. Exploratory trawling, which landed over 70,000 pounds of mixed shrimp during the last 12 months, has prompted commercial Australian companies to plan construction of 6 to 10 shrimp-fishing ports from Darwin to Cape York, and to look for 200-300 shrimp boats in the Gulf by mid-1969. ("Fishing News International," June 1968.)

AFRICA

Ghana

PLANS FISHING INDUSTRY EXPANSION

Since the fishing industry has been able to meet only 50% of the annual fish requirements, the government is planning on expansion of fisheries aid. A Fisheries Training School is being established with Norwegian assistance, US$1 million working capital will be provided for the State Fishing Corporation (SFC), and the harbor at Takoradi will be expanded to relieve overcrowding at Tema. In January 1969, fishing gear will be placed on an open general import license making it more readily available to local fishermen.

Fig. 1 - Japanese tuna boat unloading in harbor of Tema, Ghana.

Fig. 2 - Small trawlers landing fish in Tema.

Fig. 3 - A fisherman seining.

Fig. 4 - Ghana's coastline has no natural harbors and surfboats are commonly used. (FAO Photos: A. Defever)

State Fishing Corporation

SFC, which has been losing money since its inception in 1961, has yet to fulfill its quota of fish for the local market. After the government announced that it was giving the corporation a "second chance," SFC began an internal reorganization. Several senior officers were dismissed and over 100 others were asked to re-apply for their jobs--only the most qualified will be rehired.

Ghana (Contd.):

Trawler Conversion

A Japanese firm has offered to convert the Government's 10 Soviet-built trawlers into tuna fishing vessels. The trawlers, idle since the February 1966 coup, were recently offered for sale--but no takers. The Japanese estimate that it will take a year to convert the vessels. Meanwhile, a 10-man Soviet technical team is talking with the Government on several subjects, including the fate of the trawlers.

Idle Fishing Vessels

The Norwegian firm holding a management contract for SFC has loaned it about US$340,000 to purchase spare parts for repair and maintenance of 7 idle Norwegian-built fishing vessels. SFC also is buying 4 new British-built fishing vessels; 2 will be delivered soon. Ghana hopes to have 10 vessels seaworthy by the end of 1968. (U. S. Embassy, Accra, Aug. 1 and 10.)

South & South-West Africa

SHOAL FISH CATCH IN FIRST HALF REPORTED

Division of Sea Fisheries data show the following Cape west coast shoal catch for the first 6 months of the 1968 and 1967 seasons:

	Jan.-June	
	1968	1967
	. . (Short Tons) . .	
South Africa:		
Pilchards.	100,404	74,730
Maasbanker	1,365	8,940
Mackerel.	44,587	153,095
Anchovy	137,217	169,635
Red-eye herring . . .	14,671	13,966
Total	298,244	420,366
South-West Africa:		
Pilchards.	489,924	491,429
Maasbanker	54	100
Anchovy	63,635	6,098
Total	553,613	497,627

Catch of 2 Factoryships

Also, the 2 South African factoryships took 393,883 tons of pilchards for the first six months in 1968. ("The South African Shipping News and Fishing Industry Review," Aug. 1968.)

* * *

REACH FISHING AGREEMENT

South Africa and South-West Africa have agreed that no new South African factoryships will be licensed to operate in the latitudes off South-West Africa. No new licenses will be granted for exploitation of fishing grounds off South-West Africa, either by shore-based companies or factoryships, unless research proves that the present South-West African fishing industry would not be harmed. (U.S. Embassy, Pretoria, Aug. 10.)

South-West Africa

PLANS SILOS FOR FISH MEAL PELLETS

The South-West African fishing industry has requested permission to erect silos for pelletized fish meal at the Walvis Bay harbor. The silos will store fish meal for bulk shipment.

The factoryship "Suiderkruis" was very successful in pelletizing and bulk-handling fish meal. This led the local industry to seriously consider introducing a similar process in land-based factories to reduce or eventually eliminate the bagging of fish meal. ("The South African Shipping News and Fish Industry Review," July 1968.)

Morocco

FISHING INDUSTRY DEVELOPMENTS

The Moroccan Office of Exportation and Commercialization (OEC) has reported an improvement in canned fish exports. By the end of the 1967/68 fish export campaign June

Morocco (Contd.):

30, OEC was left with only a normal reserve stock of 500,000 unsold cases. Last year, on the same date, OEC had a stock of over one million cases. Sales progressed or remained steady in the usual markets for Moroccan fish, except in Germany where Moroccan exports ran into strong Italian competition. The U. S. absorbs about 2.6% of Moroccan fish exports.

Fig. 1 - Unloading sardines at Safi, Morocco. (Photo: J. Belin)

Fig. 2 - Typical purse seiner used to catch sardines.

Fig. 3 - Great quantities of fish are unloaded daily in Agadir. Part is processed in relatively new factory that produces fish-meal both for animals and people. In 1966, some went to school feeding program of UN/FAO World Food Program. (Photo: A. Defever)

Modernizing Industry

The government is very interested in modernizing its fishing fleet, installing cold-storage and freezing facilities at the principal fishing ports, consolidating and improving fish canning procedures, and expanding fish exports. The new 5 Year Plan has allotted about US$250,000 from public funds for fisheries development. Private investors are expected to contribute over $1 million. (U.S. Embassy, Rabat, Aug. 20.)

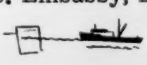
Senegal

EXTENDS TERRITORIAL SEA AND CONTIGUOUS ZONE

On July 17, Senegal extended her territorial sea from 6 to 12 nautical miles with a contiguous zone of another 6 nautical miles. The contiguous zone will not affect the rights of parties to the 1958 Geneva Conventions that effectively enforce Convention provisions.

Expanding Fleet

Pressure to extend the limits came from the National Bureau of Fisheries and Oceanography. The Bureau was anxious to ensure adequate supplies of tuna, sardinella, rouget, and sole for Senegal's expanding fleet. The fleet should number 34 tuna-freezing vessels by 1971. (U. S. Embassy, Dakar.)



Togo

STRIVES TO IMPROVE FISHING

Thousands of people live from fishing along the 75 miles of Togo's coastal belt. Their baits, equipment, and methods are primitive and their catch small. Mechanized fishing is at its beginning. When the sea is rough, the small local boats cannot cross the bar or land safely.

Fish is one of the most important sources of animal protein for the people of Southern Togo. The government has received FAO help to improve fishing.

Fig. 1 - FAO expert examines fish from a locally built drier.

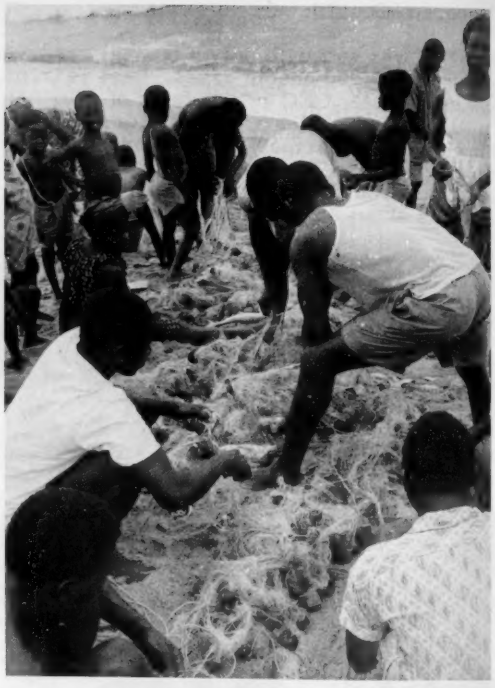


Fig. 2 - Togolese fishermen removing fish from their nets.

Fig. 3 - Beach seining is a popular Togolese fishing method. The large net is dragged in by a team of fishermen.
(FAO/C. Bavagnoli)

INDEX

Index continued page 96.

INDEX (CONTINUED)

* U. S. GOVERNMENT PRINTING OFFICE : 1968 341-141/4

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.

UNITED STATES DEPARTMENT OF THE INTERIOR

U.S. FISH AND WILDLIFE SERVICE

BUREAU OF COMMERCIAL FISHERIES

BCF Participates in International Trade Fairs

Foreign tradesmen have an opportunity to discuss availability, price and other pertinent information regarding U. S. fishery products with representatives of the BCF Office of International Trade Promotion. Full-time, proficient, multilingual interpreters are on duty at each fair. Several U. S. products first introduced at international trade shows are now firmly established in the European market. For further information, write to the Office of International Trade Promotion, Branch of Marketing, Bureau of Commercial Fisheries, 1801 N. Moore Street, Room 410, Arlington, Virginia 22209.

ent
of
on
ws
to
ial